

Meeting of the ERS Board of Trustees Audit Committee

February 22, 2017



Public Agenda Item #1

*Review and Approval of the Minutes to the
December 2, 2016 ERS Audit Committee Meeting*

February 22, 2017

Questions?

Public Agenda Item #2a

*Presentation, Discussion and Consideration of
Audit Committee Agenda items:*

External Audit Reports

February 22, 2017

Tony Chavez, Director, Internal Audit Division

State Auditor's Office Financial Audits

Tony Chavez, ERS Director, Internal Audit Division

Hillary Eckford, SAO Audit Manager

Robert Burg, SAO Project Manager

Fiscal Year 2016 CAFR

Financial Opinion Audit



- Three deliverables:
 - Independent Auditor's Report
 - Report on Internal Controls
 - Legislative Audit Committee (LAC) Report
- Unqualified Opinion
- One significant deficiency in active employee's census data.

FY2016 Pension Schedule Opinions

State Auditor's Office



- Financial schedule prepared by Finance Division in response to GASB 68 requirements
- State agencies issuing stand-alone financial statements must report their portion of the reported pension liability
- Pension Schedules are separate and stand-alone from ERS' CAFR
- Results: 1) Unqualified Opinion 2) No material weaknesses in internal controls

Actuarial Audit and Review of 2016 Actuarial Valuations

Tony Chavez, ERS Director, Internal Audit Division

Colin England, Sr. Consulting Actuary, Bolton Partners

Thomas Lowman, Vice President/Chief Actuary, Bolton Partners

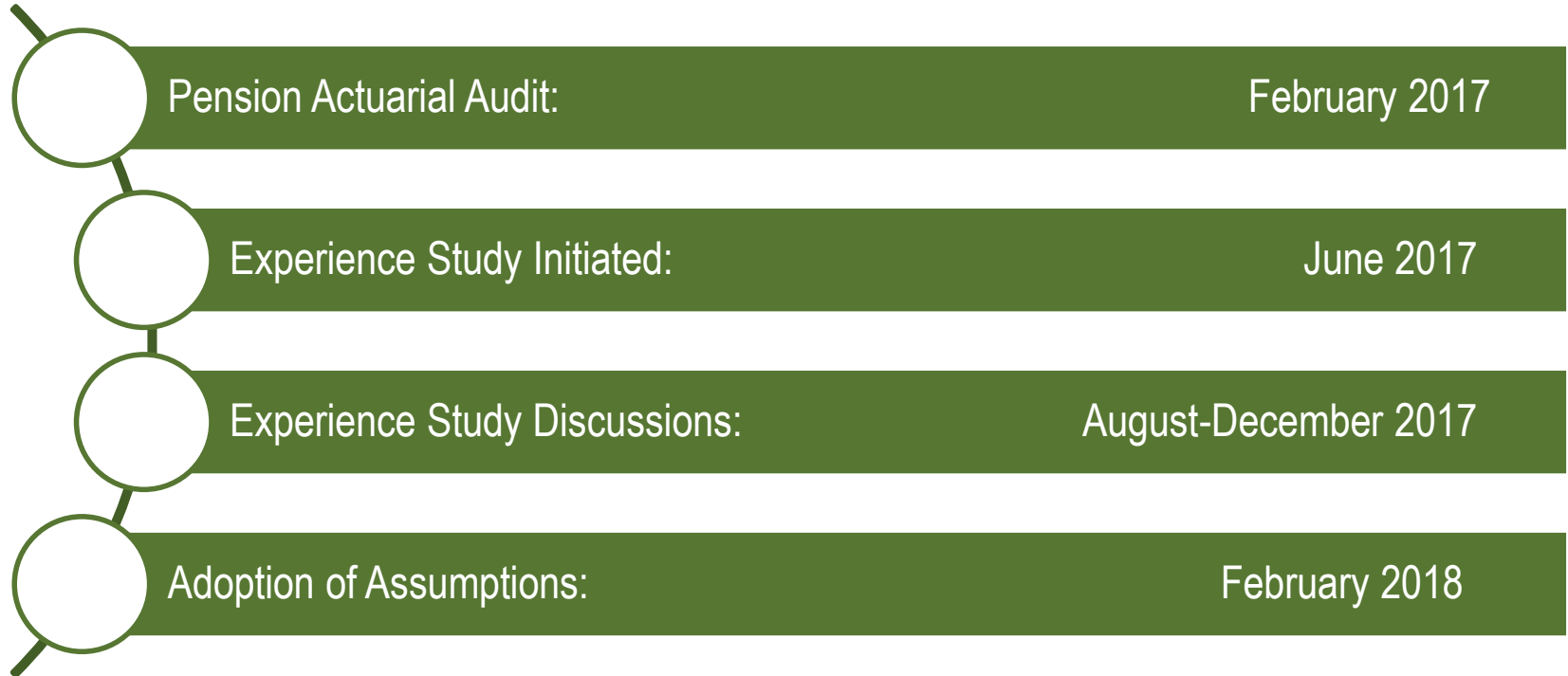
Kris Seets, Actuary, Bolton Partners

Actuarial Audit and Review



- **Government Finance Officers Association (GFOA)** recommends actuarial audits at least once every five years
- **Purpose:** Review the work of ERS' pension actuary, Gabriel Roeder Smith & Company as of August 31, 2016 for ERS' retirement plan to assure the results are actuarially sound and reasonable
- **Level Two Review:** The reviewing actuary uses a sampling of the plan's participating data to test results of the valuation. The reviewing actuary also examines the consulting actuary's methods and assumptions for reasonableness and internal consistency, but does not perform actuarial calculations
- **Awarded to:** Bolton Partners

Actuary Assumption Key Dates



2016 Valuation Audit



Presented by:

Colin England, FSA, EA, MAAA, FCA

Thomas Lowman, FSA, EA, MAAA, FCA

Kris Seets, FSA, EA, FCA

February 22, 2017

Agenda

- Purpose of Audit
- Review of Actuarial Analysis
- Suggested Revisions
- Suggested Future Enhancements
- Summary

Purpose of Audit

“ The work of ^{Actuarial} Science is to substitute facts for appearances and demonstrations for impressions”
- John Ruskin

Purpose of Audit (cont.)

Provide Board comfort that

- ▣ Gabriel Roeder Smith's (GRS) Actuarial Calculations Appropriate
 - Funding Methods and Assumptions
 - Application of methods and assumptions
- ▣ GRS' Actuarial Reports' Conclusions Accurately Portray Plans' Status
 - Effect of any current deviations
 - Effect of future events
 - How funding approach support Board's goals

Bolton Partners' Audit

Audit Plan

- Partial Replication Audit of Valuations
 - Review sufficient sample to assure results reasonable
 - Chose 53 Sample Lives
 - Across all four plans
 - Includes all significant benefit provisions and assumptions
 - Review Normal Cost and Accrued Liability
- Review Methods and Assumptions
- Review GRS Report and Conclusions

Accrued Liability and Normal Cost

Our review of 53 sample lives closely matched the valuations' results

- Accrued Liability - 100.35%
- Normal Cost - 100.18%
- Many individual sample lives matched within 0.1%

Accrued Liability and Normal Cost (cont.)

Actual matching within 2% of accrued liability and 5% of normal cost are considered acceptable matches

These results are significantly better than normal

- Prior audit (2009 valuation) matched:
 - 2.06% on normal cost
 - 0.35% on accrued liability
- So, current audit more closely matches
 - High level of confidence in GRS' Actuarial Valuations
- No recommended changes

Actuarial Assumptions

Our Review of Assumptions

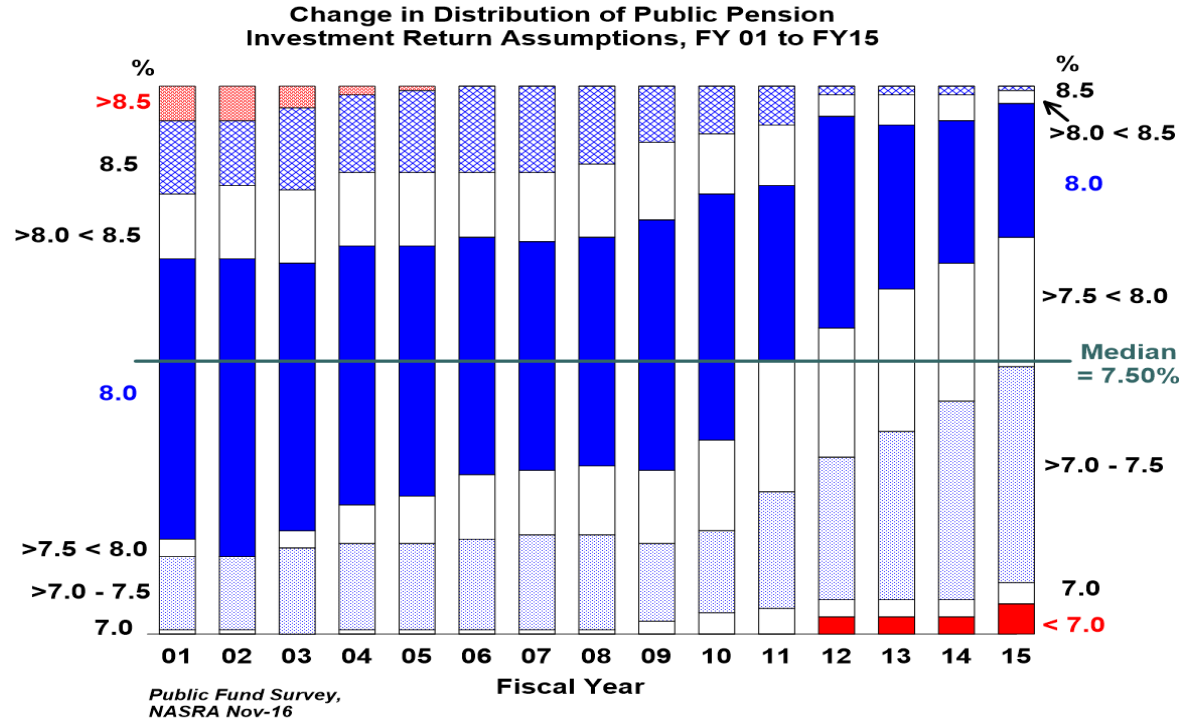
- Experience Study through August 2011
 - Turnover and Retirement
- Reviewed application of study
 - Demographic Assumptions
 - Economic Assumptions
- Need for new experience study
 - Significant changes in environment
 - Comments on new experience study

Actuarial Assumptions

Suggested Assumptions to Review

- Expected Investment returns
 - 8% currently assumed, net of investment expenses
 - Actual Experience 5.8% over last 10 years
 - Investment return expectations have reduced in last 5 years
 - States moving toward lower return and inflation assumptions
 - Accounting and Actuarial Practice requires use of bond rate for unfunded JRS1 discount assumption

Investment Assumptions



Actuarial Assumptions

Suggested Assumptions to Review

■ Inflation

- 3.5% Assumption Higher than Recent Experience
- Only provide COLAs to Judges (JRS1)
- Effect on Salary Increase and Investment Return Assumptions
- Effect on amortization of UAL (Payroll Growth Assumption)

Actuarial Assumptions

Suggested Assumptions to Review

- Mortality Assumptions
 - Currently use one assumption
 - Experience likely much better for employees
 - Also likely better for higher paid, educated employees (Judges, Legislature) and worse for public safety
 - Significant because of weighting of liability
 - Recently issued mortality and mortality improvement tables should be considered
 - Mortality improvement for disabled lives should be implemented

Funding Methods

Current Methods

- Fixed-rate Contributions
- Contribution (ADC) reasonableness
 - “Trip wire” for suggesting changes in Fixed-rate
 - Ultimate entry age normal (UEAN)
 - Asymptotic Asset Smoothing
 - Unfunded liability amortization
 - 31 year amortization
 - Open, level percentage of pay

Funding Methods

Issues with Current Methods

- UEAN
 - Intergenerational Equity
 - Only Current Tier is in Normal Cost
 - Clear reflection of Plans' funded levels
 - Accrued liability effectively includes portion of prior tiers' Normal Costs
 - Clear Communications of Costs and Funded Status
 - GASB Requirements

Funding Methods

Issues with Current Methods

- Asset Smoothing
 - Current method recognizes 1/5 of remaining difference between MVA and AVA
 - Current method out of mainstream
 - No limit on disparity between market and actuarial value
 - Very slow return to market value

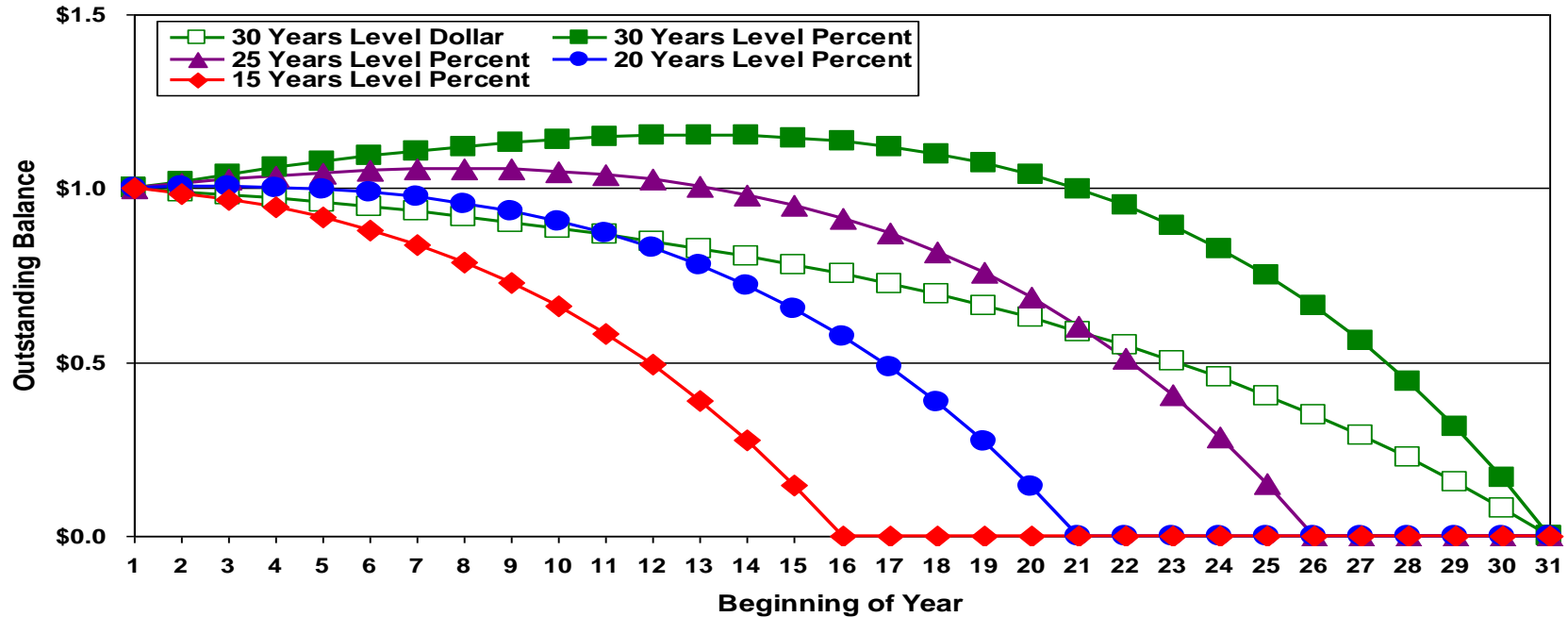
Funding Methods

Issues with Current Methods

- Amortization of unfunded liability
 - Level percentage of pay over 31 years results in increase in UAL
 - Amortization period is open, so 31 year period restarts each year
 - So, ADC always assumes UAL increases until paid in 31 years

Change in UAL under Various Closed Amortization Methods

Results of our Review



Funding Methods

Revisions to Consider

- UEAN to EAN
- Five year asset smoothing with 20% collar
- Shorter, Fixed or Open Amortization Method

Suggested Future Enhancements

Risk Modeling is part of the GRS presentation.

We recommend additional modeling of adverse experience to better understand long-term effect of significant adverse experience

- In future investment returns when plan is more mature
- Reflecting expected future increase in the unfunded accrued liability from funding approach (see pages 3 and 4 of GRS December 1, 2016 Presentation)

Summary

Overall actuarial liabilities and normal cost are reasonable, appropriate and represent a correct application of the methods and assumptions being used.

Some methods and assumptions should be revisited.

The actuarial report (consisting of presentation, and five reports) accurately portrays the financial position of the system in total, based on current assumptions.

Questions?



Questions?

Public Agenda Item #2b

*Presentation, Discussion and Consideration of
Audit Committee Agenda items:*

Internal Audit Reports

February 22, 2017

Tony Chavez, Director of Internal Audit

Investment Governance

Tony Chavez, Director, Internal Audit Division

Karen Norman, Internal Auditor

Jonathan Puckett, Internal Auditor

Consulting Engagement

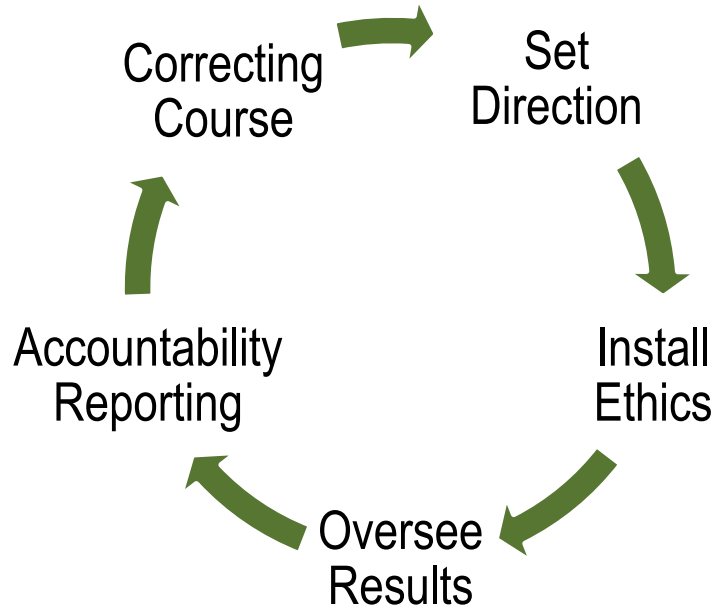


- No assurance over the effectiveness of processes and controls
- Management assisted in determining certain review procedures performed
- Greater reliance on information provided

Governance Framework



Governance - *The exercise of authority, direction, and control over an organization*



The framework that connects decision makers toward the achievement of objectives

Investment Governance



Objective: *To determine if policies and processes to achieve investment objectives are aligned with Board expectations.*

- Delegation of Authority
- Alternative Investment Decisions

Best practice - *A procedure that has been shown by research and experience to produce optimal results and that is established or proposed as a standard suitable for widespread adoption.*

Summary Results



- Delegation of authority follows best practice
- Key investment governance processes should be formalized to ensure consistency and proper execution
- Investment reports should be improved to allow for better performance oversight and accountability
- Investment governance practices should be better communicated and structured to improve transparency

Delegation of Authority

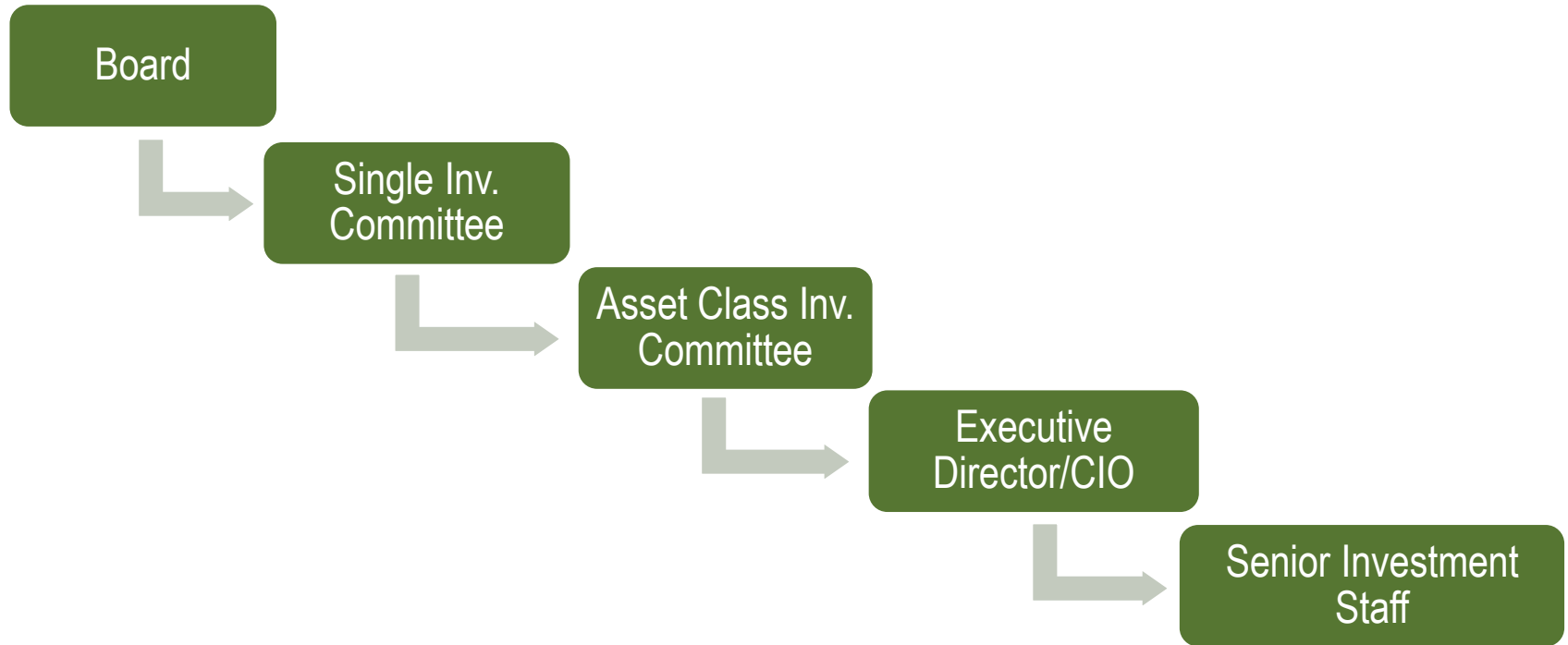


Delegation of authority for investment decisions is a best practice

A governing body should be permitted to rely on the expertise and advice of appropriately selected and unconflicted consultants and staff

- Subject matter expertise may not be available at the board level
- Improved efficiencies in the investment decision making process
- Continued board focus on strategic and mission level activities

Who to Delegate?



How to Delegate?



Investment Parameters:

- Strategic diversification
- Geographic diversification
- Industry diversification
- General asset class investment limit
- Single deal structure investment limit (i.e. co-investment)
- Single external manager/partner limit
- Limit on percent of ownership in a partnership

Formalize Processes – Investment Parameters



Investment Parameters:

- Best practices utilized
- Historical investment activity and liquidity primary factors

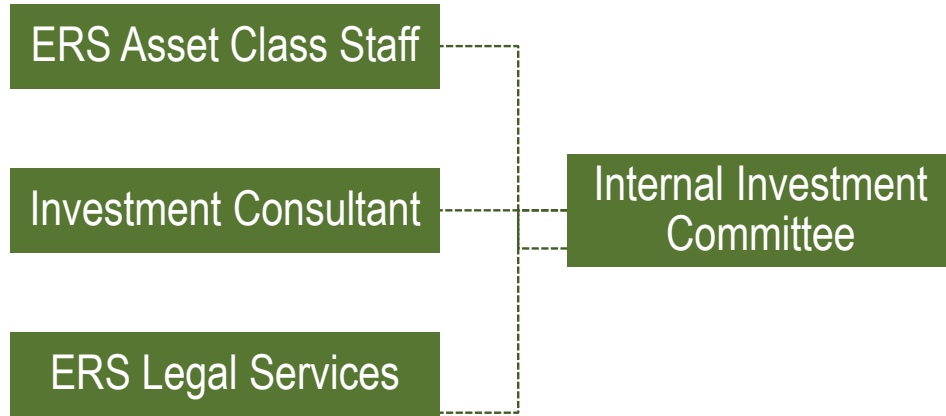
Recommendations:

- Formalize and maintain methodology
- Document when reviewed/updated
- Develop review schedule

Best Practices:

- Investment staff experience within asset class
- Size (FTE's) of investment staff
- Asset class size relative to total fund
- Asset class inherent risks/complexity

Formalize Processes – Internal Investment Committee



IAC:

- Key control in alternative investment decision process
- Reviews and approves all alternative investments

Recommendations:

- Develop formal charter
- Obtain Board approval

Formalize Processes – Consultant Contract Management



Investment Consultants:

- Provide independent company/manager assessment
- Perform parallel due diligence
- Provide independent investment recommendation

Recommendations:

- Formalize evaluation process
- Clarify Board's role over contract management
- Continue to work on procurement schedule

Contract Management Best Practices:

- Formal evaluations performed periodically
- Establishment of objective monitoring policy for service contracts
- Periodic competitive bid to evaluate market

Formalize Process – Investment Compliance



Investment Compliance:

- Currently no separate investment compliance function
- Provides real-time, independent assurance over processes
- Example is ERS' Office of Procurement and Contract Oversight

Board approved Investment Compliance Review as part of FY17 Audit Plan

Investment Reporting



Investment Report:

- Lack of clarity and purpose
- Key information not emphasized

The frequency and level of detail must be sufficient to enable the Board to understand the results and impact of those results - COSO

Recommendations:

- Determine if all current investment reports necessary
- Identify report objectives and intended communication
- Consistent report structure

Governance Communication



Governance Components:

- Communicate the organization structure, actions and duties to meet strategic objectives
- Components present and documented but difficult to locate and present
- Ad-hoc reports developed to address governance related inquiries

Recommendations:

- Develop separate governance documents (Governance Policy, Ethics Policy, Investment Policy)
- Spotlight ERS' investment governance structure

A strong, well-articulated governance structure provides the mechanism for decision makers to function together effectively. A weak, ill-defined governance structure breeds confusion and acrimony. – CFA Institute

Questions?

Investment Compliance

October 1 – December 31, 2016

Tony Chavez, Director, Internal Audit Division
Beth Gilbert, Internal Auditor
Jonathan Puckett, Internal Auditor

Investment Compliance Procedures



Personal Trades

- Three employees self-reported executing trades that were not pre-approved before executing. All exceptions would have been approved if the pre-approval process was followed.

Securities Lending

- Program temporarily suspended since February 2016
- Program is restricted to only ETFs which has caused audit flags for diversification limits through December 2016.

Questions?

Status of Audit Recommendations

Tony Chavez, Director, Internal Audit Division
Beth Gilbert, Internal Auditor

Status of Audit Plan Recommendations



Biannual

- January to June
- July to December

Implementation Status

- Implemented
- Partially Implemented
- No Action Taken
- Management Acceptance of the Risk

Methodology

- Management self-assessment
- Internal Audit review and analysis of supporting documentation
- Audit work not performed to verify the effectiveness of management actions

Status of Audit Recommendations



AUDIT ENGAGEMENT	MAP OWNER(S)	IMPLEMENTED	PARTIALLY IMPLEMENTED
Procurement	Office of Procurement and Contract Oversight	1	1
GBP Procurement Follow-Up	Office of Procurement and Contract Oversight	3	

Questions?

Public Agenda Item #2c

*Presentation, Discussion and Consideration of
Audit Committee Agenda items:*

Internal Audit Administrative Items

February 22, 2017

Tony Chavez, Director of Internal Audit

Internal Audit Charter

Tony Chavez, Director, Internal Audit Division
Beth Gilbert, Internal Auditor

Internal Audit Charter



- International Professional Practices Framework (IPPF), standard 1000, *Purpose, Authority and Responsibility* requires the Chief Audit Executive to periodically review the internal audit charter and present it to senior management and the Board for approval
- IPPF Standards were revised effective January 1, 2017
- IPPF Standard 1010, states the mandatory nature of the Core Principles for Professional Practice of Internal Auditing, the Code of Ethics, the Standards and the Definition of Internal Auditing must be recognized in the internal audit charter

Internal Audit Core Principles



- Demonstrates integrity
- Demonstrates competence and due professional care
- Is objective and free from undue influence (independent)
- Aligns with the strategies, objectives, and risks of the organization
- Is appropriately positioned and adequately resourced
- Demonstrates quality and continuous improvement
- Communicates effectively
- Provides risk-based assurance
- Is insightful, proactive, and future-focused
- Promotes organizational development

Questions?

Public Agenda Item #3

Adjournment of the ERS Board of Trustees Audit Committee

February 22, 2017

Joint Meeting of the ERS Board of Trustees and Investment Advisory Committee

February 22, 2017



Public Agenda Item #4

Review and Approval of the Minutes to the December 1, 2016 Joint Meeting of the Board of Trustees and Investment Advisory Council

February 22, 2017

Public Agenda Item #5

Review, Discussion and Consideration of ERS' Real Estate Consultant

February 22, 2017

Bob Sessa, Director of Real Estate

David Rose, Partner, AON Hewitt Global Real Estate Research Team

Real Estate Consultant

Overview



- Real Estate Team at RVK unexpectedly left to start own firm
- Contract with RVK Terminated due to diminished real estate resources
- Interim Solution: Choose real estate team from existing consulting relationships (Aon, Pavillion, Albourne)
- Aon selected due to their skill set coupled with our current needs and situation
- Contract with Aon broad enough but will be amended
- ERS has started formal solicitation process for next consultant

Aon Hewitt's Global Real Estate Team Overview

- Over \$33 billion in assets under advisement in direct real estate funds, separate accounts, and publically traded vehicles
- Currently advise >100 clients annually on long term real estate strategies, investment policies, tactical execution, and real estate investment searches
- Proactively research new investment initiatives, strategies and managers with >400 manager and fund meetings per year
- Ongoing coverage of all real estate quadrants (Equity/Debt: Private/Public) and all risk spectrums (Core, Value Added and Opportunistic); Timber, and Farmland
- 13 real estate research professionals located in key financial center hubs: Chicago, New York, San Francisco, Toronto and London
 - Average of 12 years of real estate investment industry experience
 - 9 team members with advanced degrees or certifications (e.g. MBA, CPA)
 - Diverse and complementary practitioner backgrounds including direct real estate investing, market research, portfolio management, real estate accounting, architecture and asset management

Experience

**Depth of Dedicated,
Practitioner Resources**

**Analytical
Capabilities**

Assets Under Advisement and Real Estate Consulting Team statistics as of 12/31/2016

Dedicated Global Real Estate Consulting Team

Global Real Estate Consulting Team / Resources

US Team

Catherine Polleys, CRE
(Partner & Co-Head of Global Real Estate)

David Rose, CPA
(Partner & Head of Due Diligence)

Chae Hong

Jani Venter

Tim Zukowski

Kirloes Gerges

Sarah Trombello

Katherine Miller

UK/European Team

Nick Duff
(Partner & Co-Head of Global Real Estate)

Oliver Hamilton

Hani Legris*

Saran Satefanen*

Canadian Team

Catherine Marshall

Shared Resources

Private Market Reporting and Compliance

Christopher Brandely

Brigid Bower

Ryan Hegy

Laura Siegman

Operational Due Diligence

Rian Akey, Richard Spivey,
Chris Goodeve-Ballard,
Mark Flanagan, Joe Ingalsbe,
Griffin Keenan & Sonja Zupevec

Questions

Public Agenda Item #6

Review and Discussion of ERS' Asset Allocation and Liability Study:
Updated Capital Market Assumptions, Asset Mixes, and Portfolio Stress Testing

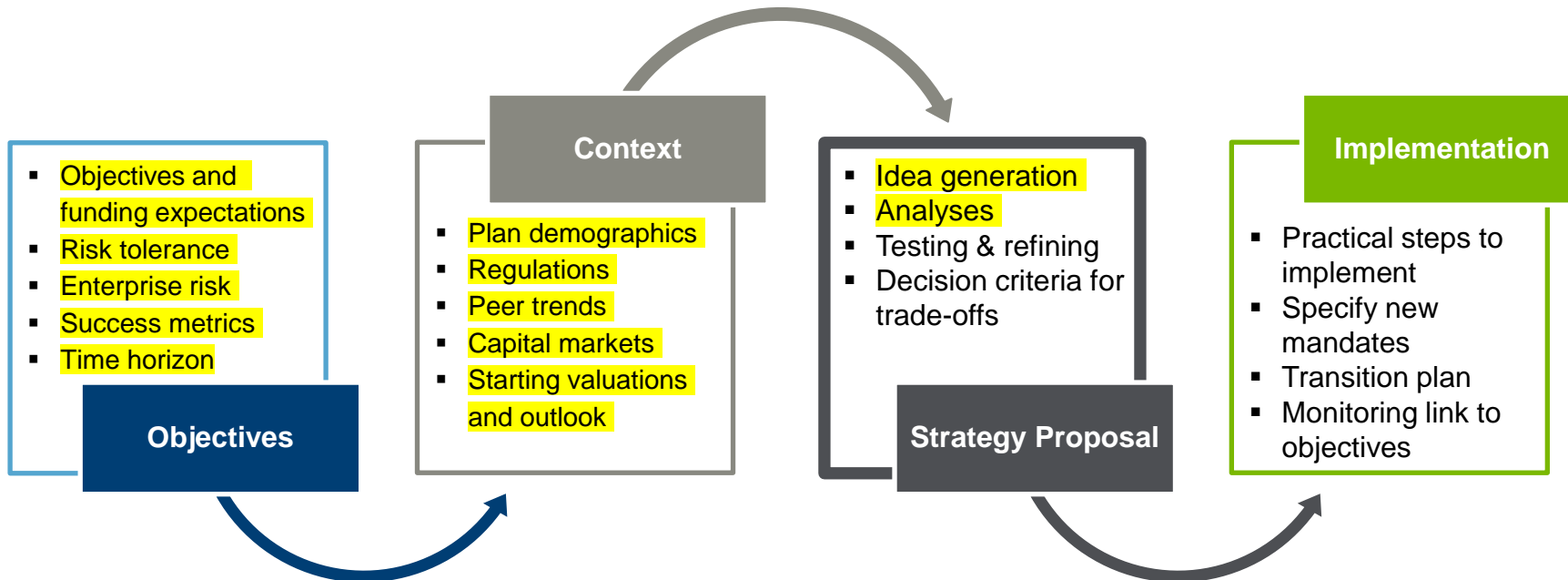
February 22, 2017

Tom Tull, CFA, Chief Investment Officer
Sharmila Kassam, Deputy Chief Investment Officer
Steve Voss and Kristen Doyle, Aon Hewitt

Agenda

- Review of Asset Liability Process
- Review of Updated Capital Market Assumptions
- Review of Current Asset Allocation
- Proposed Asset Allocation Alternatives
- Stress Testing, Scenario Analysis, and Factor Risk Analysis
- Review of Asset Liability Process Timeline

Asset Liability Process Overview



Review of Updated Capital Market Assumptions

Capital Market Assumptions Update

Second Quarter 2016 Assumptions vs. November 2016 Assumptions (10-Year)

	Policy	3/31/2016		12/31/2016	
	Weight	Return	Risk	Return	Risk
Return Seeking Assets:	79%				
Global Equity	55%				
Public Equity	45%	7.2%	18.5%	7.3%	18.5%
Private Equity*	10%	9.3%	24.5%	9.3%	24.5%
Global Credit	10%				
High Yield	10%	6.1%	12.0%	4.7%	12.0%
Private Credit	0%	5.5%	9.5%	6.5%	9.0%
Real Assets	14%				
Real Estate*	10%	7.5%	15.0%	7.5%	15.0%
Infrastructure*	4%	7.0%	12.0%	7.0%	12.0%
Risk Reduction Assets:	21%				
Absolute Return	5%				
Absolute Return Portfolio*	5%	5.0%	3.6%	5.0%	3.6%
Rates	15%				
Intermediate Treasuries	15%	1.6%	2.0%	2.6%	3.0%
Cash	1%				
Cash	1%	1.5%	1.0%	2.4%	1.0%
Inflation*		2.5%		2.5%	
Estimated Return (Nominal)		6.8%		6.9%	
Estimated Risk		12.0%		12.0%	
Sharpe Ratio**		0.442		0.374	

- Following the November election interest rates increased meaningfully, credit spreads contracted, and the equity market rallied

- The contraction in credit spreads has decreased our forward looking expected returns for high yield bonds

- The higher than expected rise in rates has increased our expected return for intermediate treasuries and cash

- A higher LIBOR assumption increased the expected return of private credit

**The Sharpe Ratio is a measure of risk-adjusted performance. It measures the projected excess return (or risk premium) per unit of deviation of the portfolio returns. The greater a portfolio's Sharpe Ratio, the better its forecasted risk-adjusted performance

*Custom assumption of ERS Staff and AHIC

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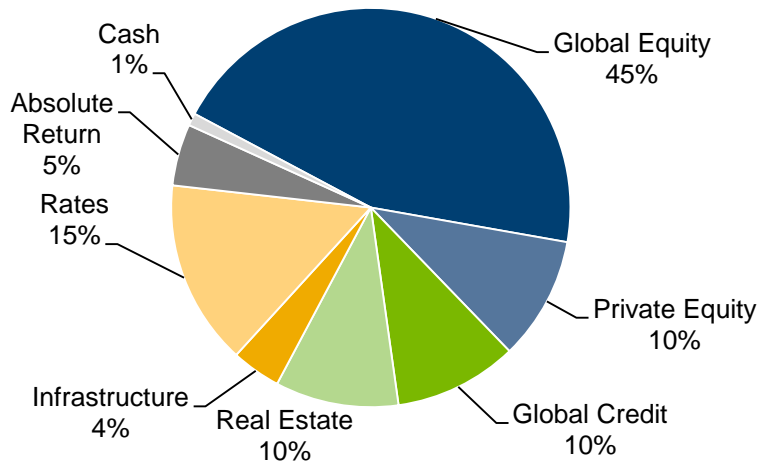
Investment advice and consulting services provided by Aon Hewitt Investment Consulting, Inc., an Aon Company.



Review of Current Asset Allocation

Current Long-Term Policy Target

**Current
Long Term Policy Target Asset Allocation**



Fund	Market Value (12/31/2016)	Weight	Policy
Global Equity	\$11,882,049,490	46.4%	45.0%
Private Equity	\$2,818,260,724	11.0%	10.0%
Global Credit (High Yield)	\$2,169,564,781	8.5%	10.0%
Real Estate	\$2,392,695,666	9.3%	10.0%
Infrastructure	\$440,853,775	1.7%	4.0%
Special Situations	\$90,071,886	0.4%	0.0%
Rates	\$3,988,727,420	15.6%	15.0%
Absolute Return	\$1,405,652,512	5.5%	5.0%
Cash	\$402,696,921	1.6%	1.0%
Total Portfolio	\$25,590,573,174	100.0%	N/A

- The graph and table above depict the Plan's current asset allocation and Long Term Policy targets

Risk & Return Expectations¹ -- Current Policy Targets

Asset Class	Current Policy Targets	Expected Nominal Return	Expected Risk
Global Equity	45.0%	7.3%	18.5%
Private Equity	10.0%	9.3%	24.5%
Global Credit (High Yield)	10.0%	4.7%	12.0%
Real Estate	10.0%	7.5%	15.0%
Infrastructure	4.0%	7.0%	12.0%
Rates	15.0%	2.6%	3.0%
Absolute Return	5.0%	5.0%	3.6%
Cash	1.0%	2.4%	1.0%
Estimated Return (Nominal)	6.9%	--	--
Estimated Risk	12.0%	--	--
Sharpe Ratio ²	0.374		

- The table above illustrates our long-term return and risk forecasts for the various asset classes that the Plan invests in as well as for the Plan as a whole, given current policy targets

¹ Above analysis reflects 12/31/2016 CAPM assumptions from AHIC; assumptions are 10-year projections and are revised quarterly by AHIC. There can be no guarantee that any of the expected return values shown will be achieved. .

²The Sharpe Ratio is a measure of risk-adjusted performance. It measures the projected excess return (or risk premium) per unit of deviation of the portfolio returns. The greater a portfolio's Sharpe Ratio, the better its forecasted risk-adjusted performance

Probability of an 8.0% Return

Probability of 8.0% Return	Current
5 Years	41.7%
10 Years	38.3%
30 Years	30.3%
Probability of Negative Annualized Return	Current
1 Year	27.5%
3 Years	15.0%
5 Years	9.0%
10 Years	2.9%
5th Percentile Annual Returns	-11.0%

- The expected return of the Plan under the current asset allocation is 6.9%
- The probability of the Plan producing a 8.0% return over 10 years is 38.3%

Proposed Asset Allocation Alternatives

Overview

- The current asset allocation produces an expected return of 6.9%
- Diversifying asset classes can be used to dampen the distribution of expected outcomes and enhance returns
- Additional credit diversification produces compelling risk adjusted outcomes
- The following slides detail the risk profile of three asset allocations;
 - Current Target
 - **Risk Reducing** – Decrease equity exposure; increase opportunistic/private credit exposure
 - **Enhanced Return** – Decrease equity and rates exposure; increase private equity, global credit, and infrastructure exposure
 - **Diversified** – Decrease equity, credit, and rates exposure; increase private equity, real estate, infrastructure, and opportunistic/private credit exposure
- The allocations are outlined on the next slide

Comparison of Proposed Allocation Mixes – 10 Year Forecast

Asset Class	Current	Risk Reducing	Enhanced Return	Diversified
Global Equity	45.0%	40.0%	42.0%	40.0%
Private Equity	10.0%	10.0%	13.0%	12.0%
Global Credit*	10.0%	10.0%	12.0%	5.0%
Real Estate	10.0%	10.0%	10.0%	11.0%
Infrastructure	4.0%	4.0%	6.0%	6.0%
Opportunistic/Private Credit**	--	5.0%	--	7.0%
Return-Seeking Assets	79.0%	79.0%	83.0%	81.0%
Rates	15.0%	15.0%	11.0%	13.0%
Absolute Return	5.0%	5.0%	5.0%	5.0%
Cash	1.0%	1.0%	1.0%	1.0%
Risk-Reducing Assets	21.0%	21.0%	17.0%	19.0%
Expected Return	6.9%	6.8%	7.1%	7.0%
Expected Risk	12.0%	11.2%	12.2%	11.5%
Sharpe Ratio	0.374	0.392	0.385	0.398

- Further diversification of the credit exposure can enhance risk adjusted results
- Increase allocations to illiquid asset classes can increase expected returns
- This analysis is to review the trade-offs of various asset mixes
- Evaluating increases or decreases of return seeking assets will be part of the asset liability study

* Risk Reducing (7% high yield and 3% EMD); Enhanced Return (8% high yield and 4% EMD); Diversified (3% high yield and 2% EMD)

**Risk Reducing (2.5% private credit and 2.5% real estate debt); Diversified (3.5% private credit and 3.5% real estate debt)

Asset Allocation Scenarios: Key Statistics

Probability of 8.0% Return	Current	Risk Reducing	Enhanced Return	Diversified
5 Years	41.7%	40.5%	43.4%	42.6%
10 Years	38.3%	36.7%	40.7%	39.5%
30 Years	30.3%	27.8%	34.2%	32.3%
Probability of Negative Annualized Return	Current	Risk Reducing	Enhanced Return	Diversified
1 Year	27.5%	26.4%	27.2%	26.1%
3 Years	15.0%	13.7%	14.6%	13.3%
5 Years	9.0%	7.9%	8.7%	7.6%
10 Years	2.9%	2.3%	2.7%	2.1%
5th Percentile Annual Returns	-11.0%	-10.0%	-11.0%	-10.1%

- The likelihood of achieving a 8.0% return can be modestly increased through asset allocation changes
- These changes can also dampen losses in a negative market environment

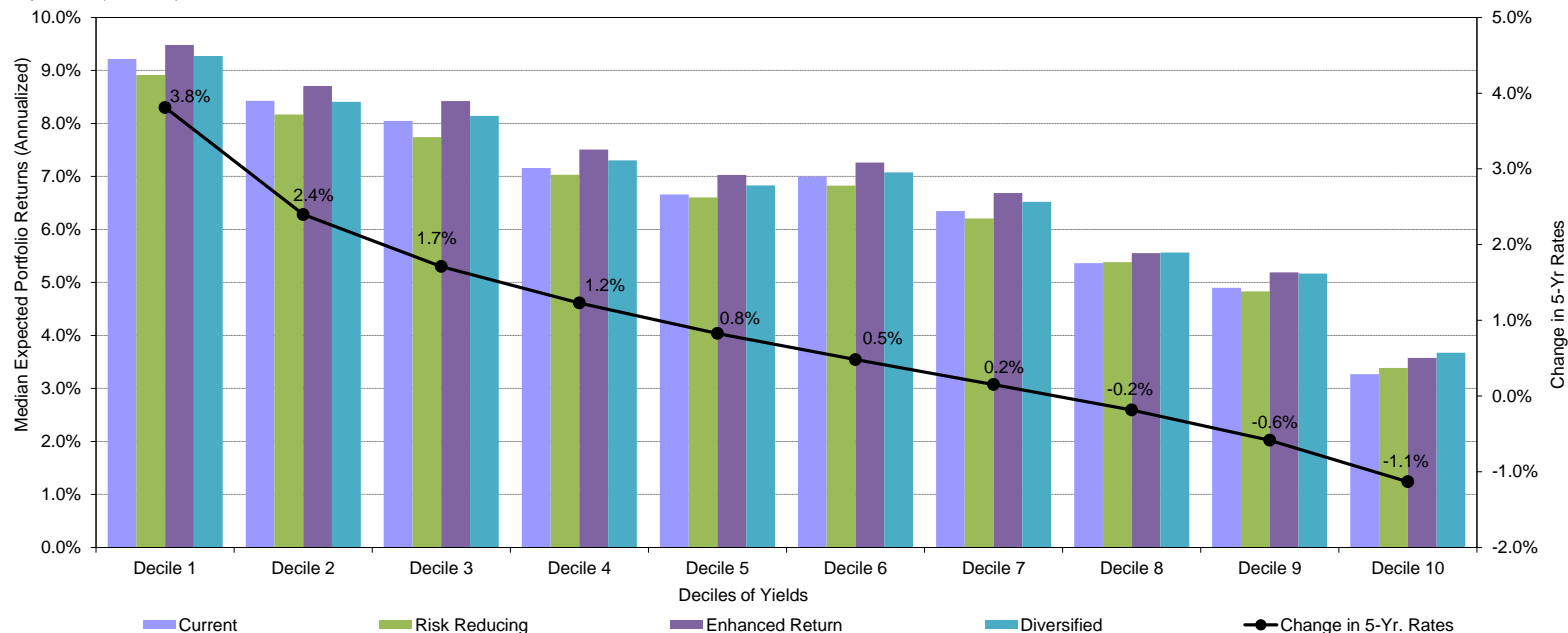
Stress Testing, Scenario Analysis, and Factor Risk Analysis

What are the Three Year Economic Scenarios?

- A set of forward looking economic scenarios designed to allow for the evaluation of how an asset mix is impacted by various market scenarios
- The results for each asset mix are grouped by decile
- The modelled scenarios for this presentation are:
 - **Change in 5-Yr. Rates:** Decile medians ranging from 3.8% to -1.1%
 - **Global Equity Returns:** Decile medians ranging from 25.6% to -12.8%, annualized
 - **Inflation:** Decile medians ranging from 3.8% to 1.1%, annualized
- In aggregate, over ten years, the scenarios are consistent with our long term capital market assumptions
 - This ensures that outcomes are in line with our asset liability analysis
- Return expectations provided on the following slides are the result of Monte Carlo simulation, and differ from our long term capital market assumptions over a three year period

Economic Scenarios – Change in 5-Yr. Rates

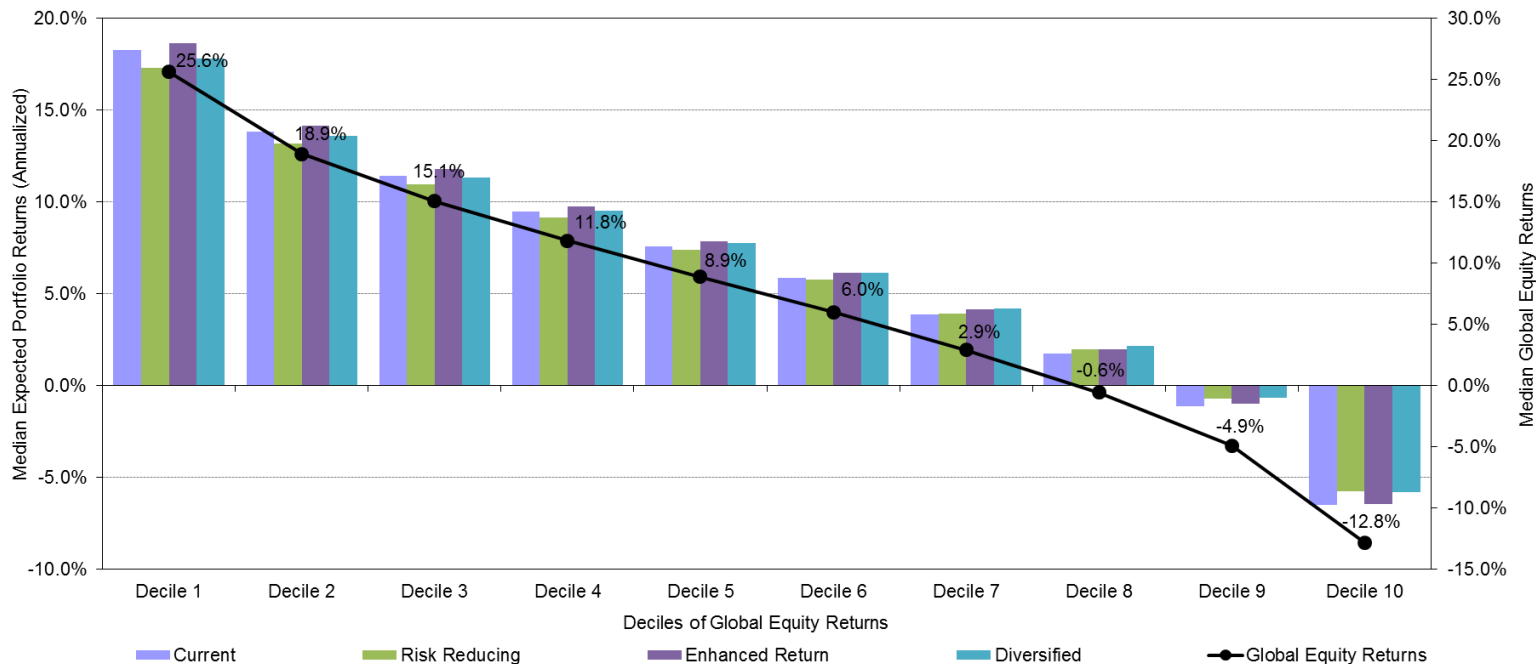
Expected (Median) Total Portfolio Returns in Deciles -- THREE YEAR HORIZON



- Further diversification benefits become more obvious as you move further from the median outcome (5th decile)
- Changes in the level of interest rates can have meaningful impacts on portfolio performance, as shown

Economic Scenarios – Global Equity Returns

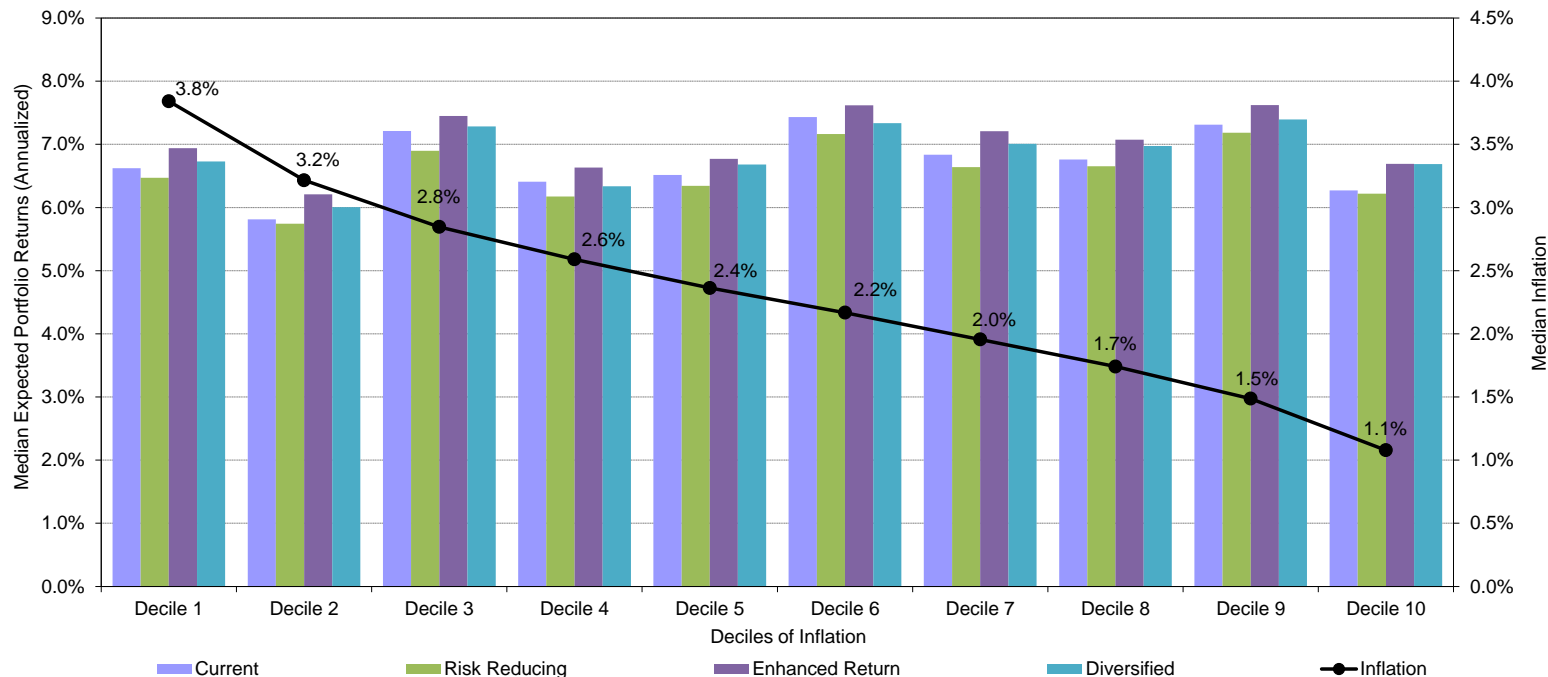
Expected (Median) Total Portfolio Returns in Deciles -- THREE YEAR HORIZON



- Risk Reducing and Diversified produce inferior results in the top deciles, and are beneficial in the lower deciles
- Equity beta is a key driver of expected return within the portfolio, and is reflected in the decile data above

Economic Scenarios – Inflation

Expected (Median) Total Portfolio Returns in Deciles -- THREE YEAR HORIZON



- The benefits of the Risk Reducing portfolio are reduced in a rapidly rising rate environment
- In the short run, inflation has a low impact on portfolio performance

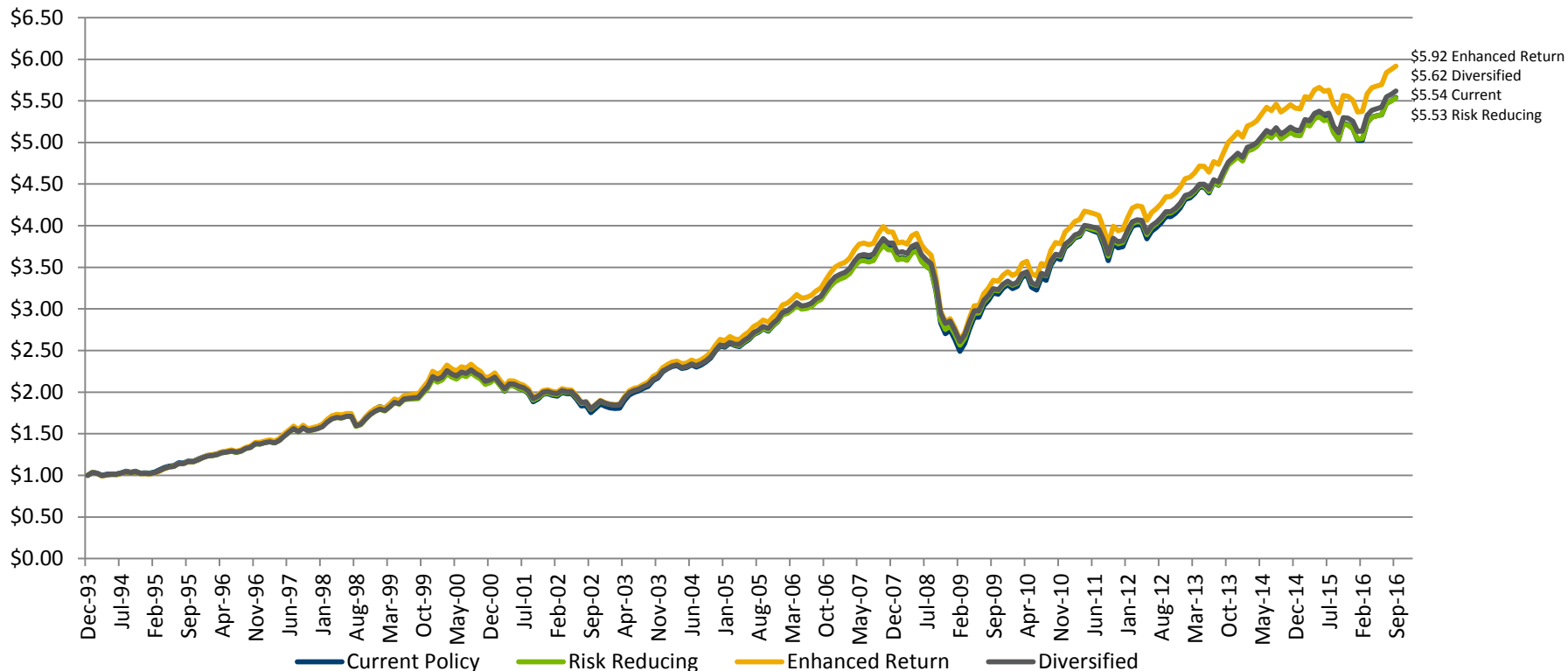
Asset Allocation Scenarios: Historical Performance

	Performance(%)				
	1 Year	3 Years	5 Years	10 Years	Jan-1994 To Sep-2016
Current Policy	10.1	6.2	9.1	5.9	7.8
Risk Reducing	9.8	6.2	8.8	5.9	7.8
Diversified	9.8	6.5	8.9	6.0	7.9
Enhanced Return	10.5	6.6	9.4	6.2	8.1

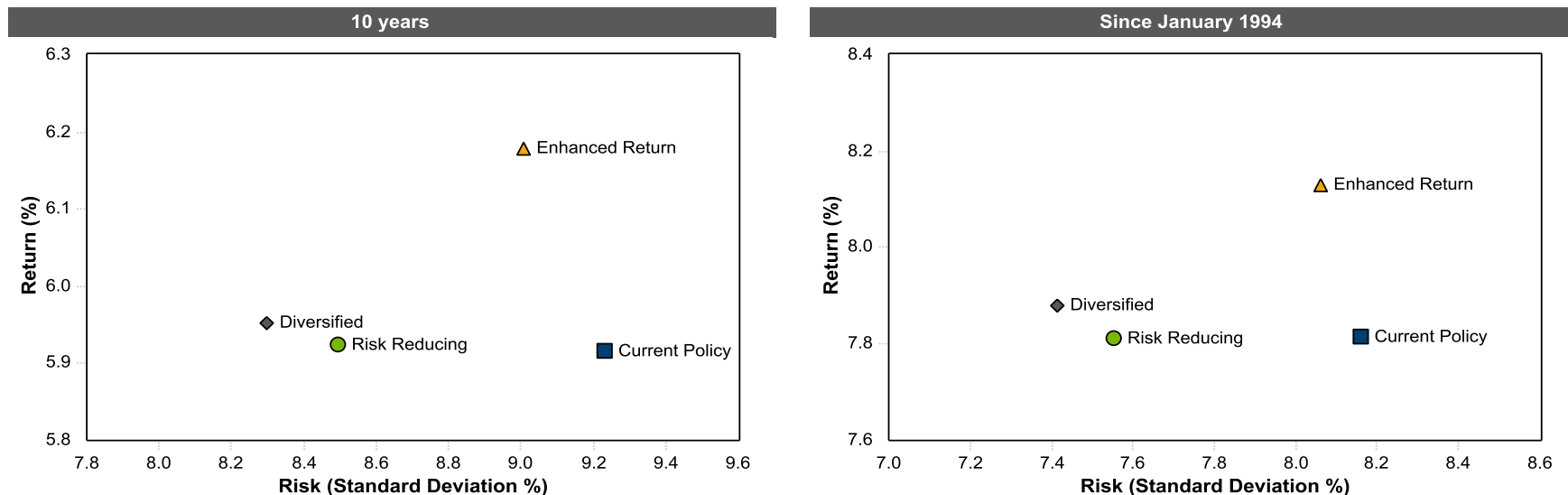
	Performance(%)									
	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006
Current Policy	1.3	5.3	15.1	12.4	0.3	13.6	19.8	-26.5	11.6	17.5
Risk Reducing	1.5	5.3	13.6	11.9	1.0	13.2	18.8	-24.6	11.4	16.7
Diversified	2.0	5.7	14.2	11.8	1.1	13.3	16.8	-24.7	12.0	17.7
Enhanced Return	1.7	5.7	14.8	12.7	0.7	13.9	19.6	-26.5	12.0	18.4

- The table above outlines historical performance of each asset mix over various time periods
- Calendar data is useful in evaluating performance in different market environments

Asset Allocation Scenarios: Growth of a Dollar (Since January 1994)



Asset Allocation Scenarios: Risk Adjusted Returns



- For the longest common period of returns, the three portfolios have produced risk adjusted returns in line with our projected assumptions
 - Risk Reducing – produced similar return at a lower level of volatility
 - Enhanced Return – produced a higher return at a similar level of volatility
 - Diversified – produced slightly higher return at a slightly lower level of volatility

Asset Allocation Scenarios: Stressed Market Periods

	Current	Risk Reducing	Enhanced Return	Diversified	Dow Jones U.S. Total Stock Market Index
Credit Squeeze 2008 (10/1/2007 - 11/30/2008)	-27.42%	-25.24%	-27.10%	-24.82%	-40.3%
04 Bond Sell Off (3/1/2004 - 8/31/2004)	0.65%	0.91%	1.13%	1.11%	-3.2%
Bond Market Crash (2/1/1994 - 5/1/1994)	-1.86%	-2.20%	-2.14%	-1.75%	-4.9%
Dotcom Hangover (4/1/2002 - 9/30/2002)	-12.13%	-10.59%	-11.87%	-10.78%	-27.3%
Dot Bomb (10/1/2000 - 3/30/2001)	-9.02%	-7.84%	-9.22%	-8.35%	-21.4%
Nasdaq Correction % (11/1/1998 - 12/31/1999)	29.94%	28.81%	32.52%	30.26%	39.7%
97 Japan Crash (7/1/1997 - 12/31/1997)	2.93%	3.10%	2.85%	2.91%	11.6%

- The analytic above shows how each investment policy performed during different market stress periods

Factor Risk Analysis: Motivation

Provides an alternative to traditional asset allocation and risk analysis

Allows attribution of risk to common factors and to adjust exposures in response to investment objectives

Exposures to underlying economic factors can be identified both on absolute and benchmark-relative basis

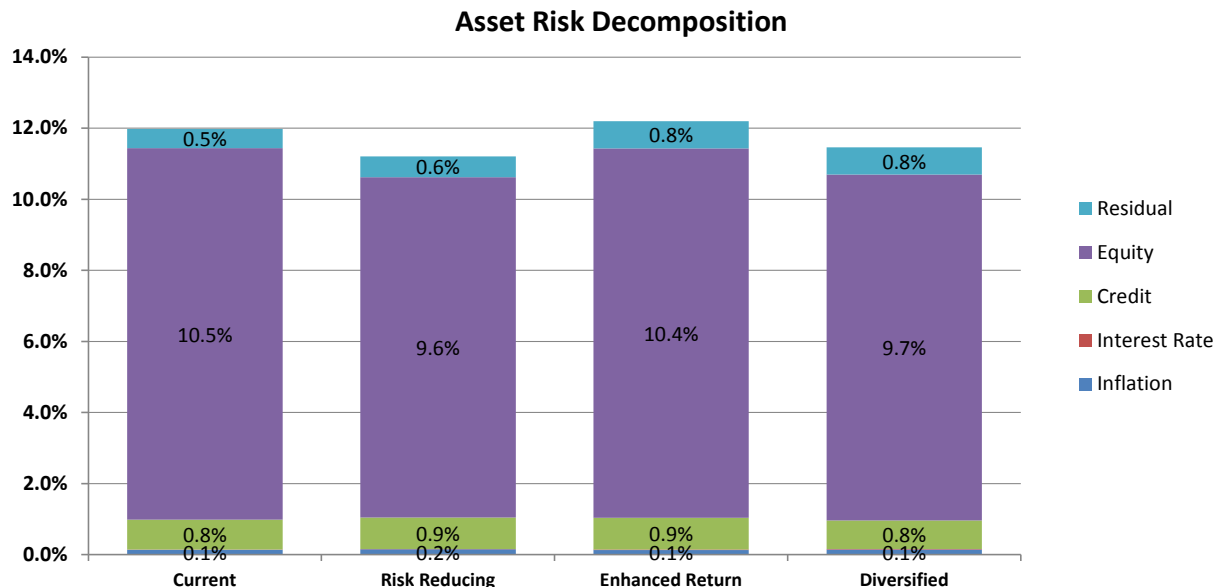
Ability to take control of the portfolio's exposure to economic factors and adjust exposures depending on both long- and medium-term views

- Direct investment to provide exposures to desired factors, or correct imbalanced exposures
- Overlay to hedge certain exposures during market dislocations
- Overall, diversify risk among factors as well as asset types

Factor Set – Forward-Looking

- Factors are constructed using AHIC's forward-looking (expected) forecasts for risks and correlations of asset classes
- **Inflation:** [U.S. Consumer Price Index]
- **Interest Rate:** [Long-Term Government *Nominal* Return - *Inflation*]
- **Credit:** [Long-Term Credit *Real* Return – Interest Rate (Long-Term Government *Real* Return)]
- **Equity:** [Global Equity *Real* Return – *Credit*]
- **Residual:** Unexplained sources of risk

Asset Risk Decomposition* – Forward Looking



*Based on Q1 2017 Aon Hewitt capital market assumptions

- Typical for most public funds, equity risk dominates
- For the proposed portfolios, a greater proportion of risk comes from credit when compared to the current target, due to greater exposure to diversifying credit exposures

Asset Allocation Alternatives Findings

- The Plan is currently well diversified and asset allocation changes can only have marginal benefits
- Adding diversifying credit exposure or increasing illiquid exposure can help reduce expected volatility or even increase the expected return
- The additional asset class exposures can lower the Plan's reliance on public equity market risk
- The diversification benefits of the additional asset classes are reflected in AHIC's forward looking capital market assumptions, and historical investment performance

Review of Asset Liability Process Timeline

Asset Liability Process Overview

Asset Allocation Study	Dates	Completion Status
Orientation with staff and distribution of risk survey to Board and IAC	August - October 2016	Presented
Presentation of risk survey results; Presentation on macroeconomic view and capital market assumptions	December 2016 Board Meeting	Presented
Conduct Asset Allocation Working Session #1 - General Discussion	February 2017 Board Meeting	Presented
Conduct Asset Allocation Working Session #2	May 2017 Board Meeting	
Conduct Asset Allocation Working Session #3	August 2017	
Conduct Asset Allocation Working Session #4	December 2017 Board Meeting	
Present Asset Allocation and Investment Policy Changes for Board Consideration	February 2018	

Questions

Public Agenda Item #7a

Review and Discussion of the Investment Advisory Committee

7a. Eligibility and Compliance for Calendar Year 2016 of the IAC

February 22, 2017

Tom Tull, CFA, Chief Investment Officer

Eligibility and Compliance for CY 2016

Investment Advisory Committee Skills Assessment



	Investment Experience	IAC Tenure	Asset Class Expertise
<u>IAC Chair</u> James Hille, CFA, CAIA	26 years	(2011) 5 yrs.	Global Equity, Fixed Income, Private Equity, Real Estate, Hedge Funds
<u>IAC Vice-Chair</u> Caroline Cooley	33 years	(2013) 3 yrs.	Hedge Funds, Derivatives
Bob Alley, CFA	42 years	(1999) 17 yrs.	Fixed Income
Ken Mindell	37 years	(2006) 10 yrs.	Global Equity, Fixed Income, Private Equity, Real Estate, Hedge Funds
Dr. Laura Starks	29 years	(1990) 26 yrs.	Global Equity, Fixed Income, Private Equity, Real Estate, Hedge Funds
Lenore Sullivan	37 years	(2010) 6 yrs.	Real Estate

Questions

Public Agenda Item #7b

Review and Discussion of the Investment Advisory Committee

7b. IAC Self Evaluation Report

February 22, 2017

Sharmila Kassam, Deputy Chief Investment Officer

IAC Self Evaluation Report

Agenda



- We have completed the IAC Self-Evaluation
- The goal of this survey was to:
 - Ensure participation and assess fulfillment of IAC's fiduciary duty
 - Gauge areas of IAC concern
 - Obtain Critical Feedback
- Goal for today:
 - Provide an overview of the survey results
 - Discuss the various perspectives

IAC Self Evaluation Report

Overview of Average Responses



- Observations
 - Question 1, ***IAC's understanding of ERS' mission and goals*** received the highest rating
 - Question 4, ***quantity of IAC meetings***, and question 12, ***effectiveness of IAC performance assessments*** received the lowest ratings.

IAC Self Evaluation Report

IAC (Group) Understanding of ERS Investment Program

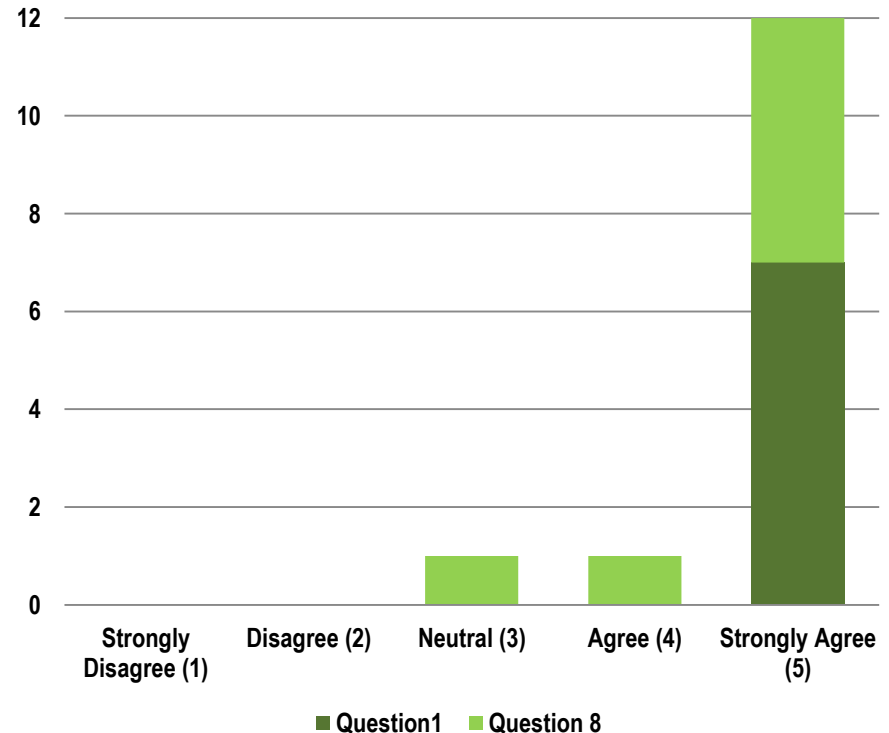


- Observations

- Most strongly agree that IAC as a whole understands the ERS Investment Program and relevant duties/requirements

Q1: Understanding of ERS' mission and goals

Q8: Understanding of fiduciary duties, confidentiality, and conflicts of interest



IAC Self Evaluation Report

Individual Understanding of ERS Investment Program



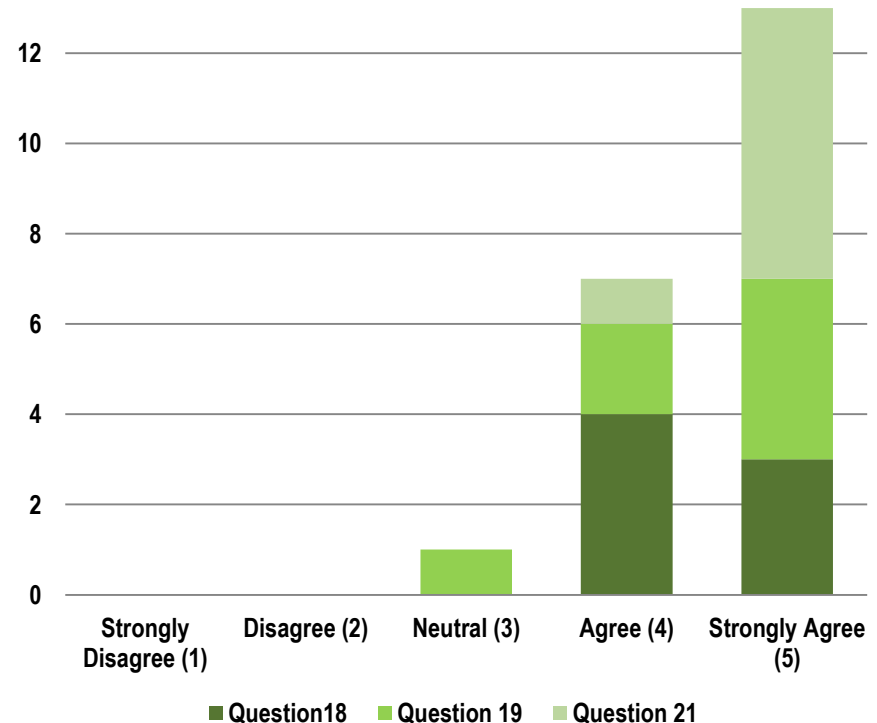
- Observations

- Most agree individual members understand the ERS Investment Program and their role in that program

Q18: I understand the Investment Policy, investment program, and overall organization

Q19: I understand my role as the IAC member

Q21: I understand my duties as an IAC member



IAC Self Evaluation Report

Effectiveness on Program Strategy



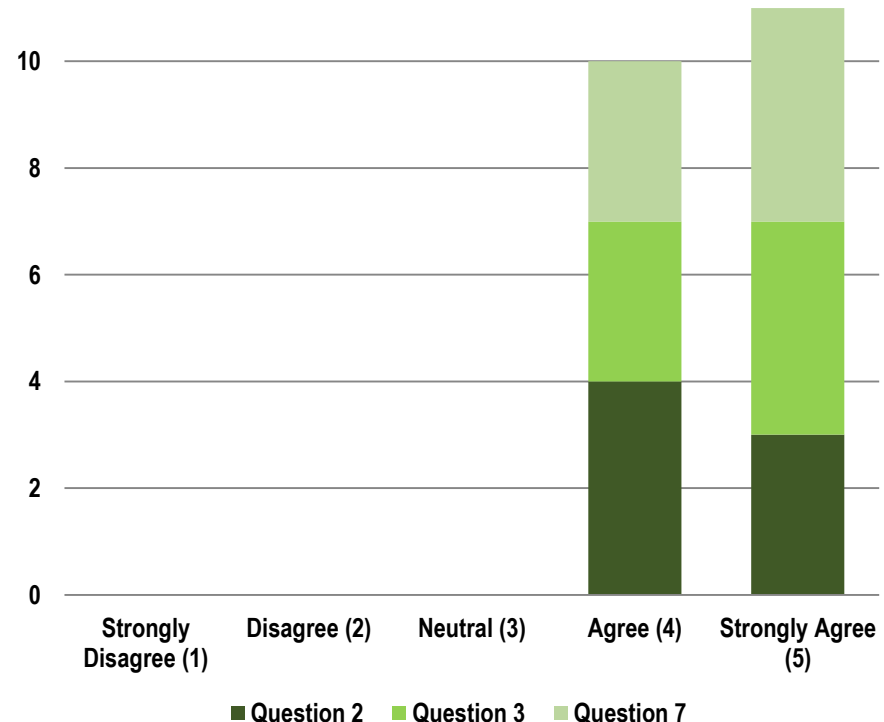
- Observations

- All agree that IAC is effective in advising the Board on the ERS Investment Program strategy

Q2: Effectiveness of direction/expertise

Q3: Cognizance of risk and reward factors

Q7: IAC members are prepared, understand investment practices, and interact meaningfully



IAC Self Evaluation Report

Effectiveness on Program Implementation



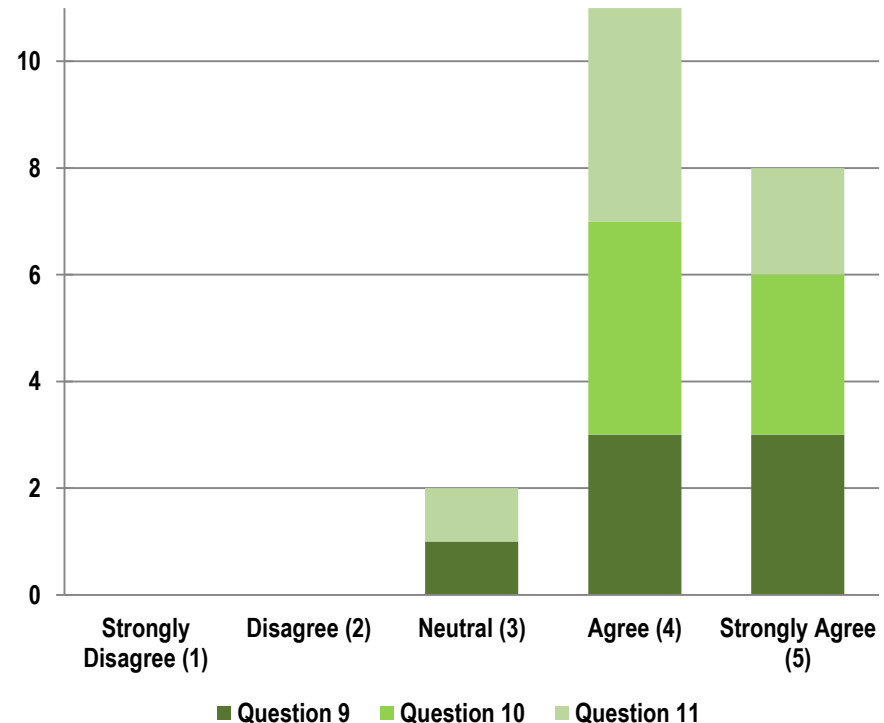
- Observations

- Most agree that IAC is effective at advising the Board on ERS Investment Program implementation

Q9: Effectiveness of IAC contributions

Q10: Effectiveness of IAC guidance and direction on asset allocation strategies

Q11: IAC effectively monitors implementation of asset allocation strategies



IAC Self Evaluation Report

Individual Member Effectiveness



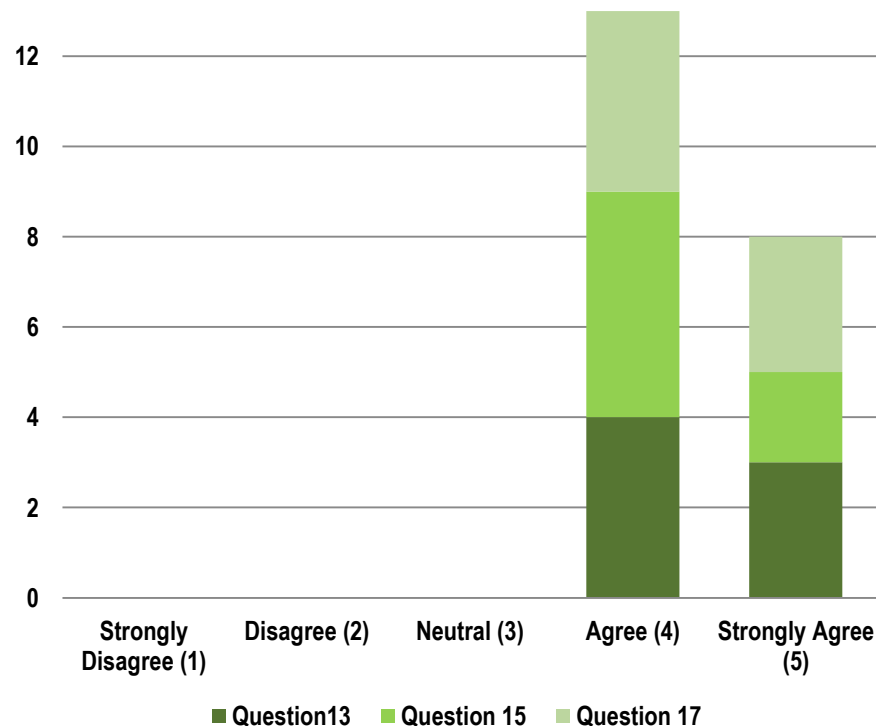
- Observations

- All agree they individually make an effort to be competent and effective in advising staff and the Board.

Q13: I attend meetings, listen, and contribute

Q15: I review relevant materials in advance

Q17: I try to be educated on asset classes that are outside m area of expertise.



IAC Self Evaluation Report

Level of Individual Engagement/Adherence to Policy

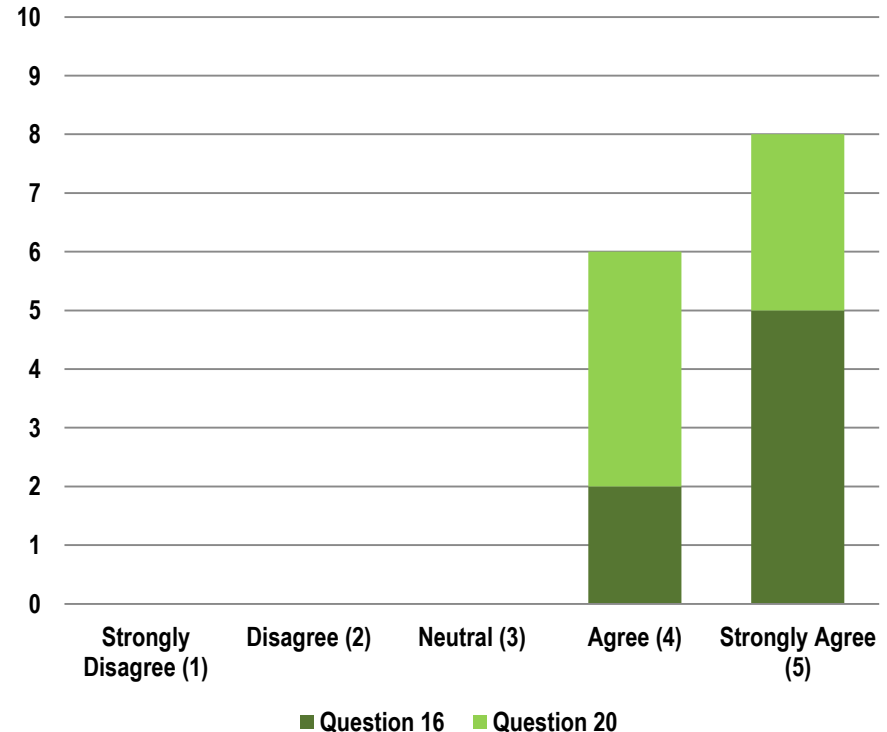


- Observations

- Most agree they are comfortable objecting to positions of staff and others
- Most also agree they disclose potential conflicts of interest

Q16: I disclose potential conflicts of interest

Q20: I'm comfortable objecting to positions of staff or other IAC/Board members



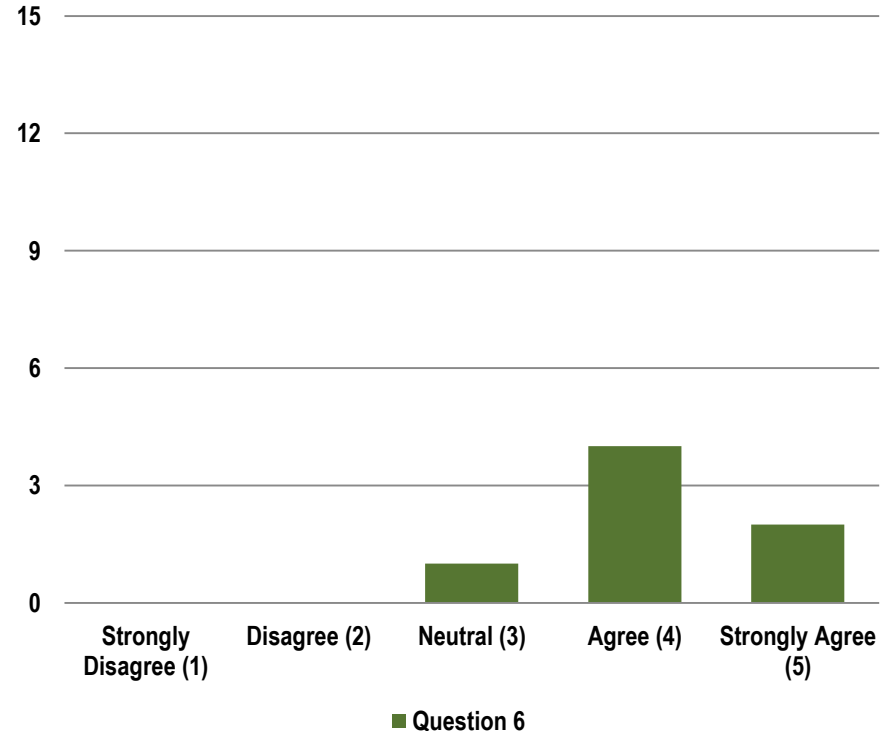
IAC Self Evaluation Report

Quality of Resources Provided



- Observations
 - Most agree that resources provided are sufficient and timely

Q6: Receives relevant materials sufficiently in advance



IAC Self Evaluation Report

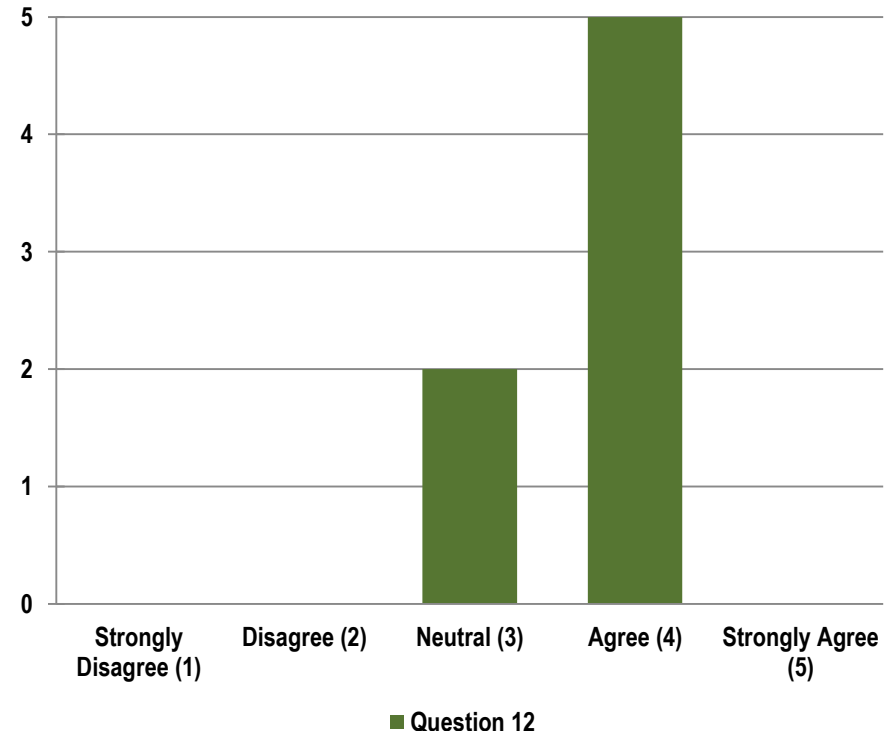
Provided Effective Assessment of Performance



- Observations

- Received a relatively low response
- The purpose of initiating the study and self assessment is to address this concern

Q12: IAC is provided effective assessment of its performance and contributions



IAC Self Evaluation Report

Review



- Items of strong agreement:
 - Q1: IAC's understanding and incorporation of ERS' mission and goals
 - Q16: Informing ERS of conflicts of interest and abstaining from related activity
 - Q21: IAC's understanding of duties and ability to act in best interest of stakeholders

Results strongly indicate the IAC understands their purpose and responsibility.

IAC Self Evaluation Report

Review



- Items of lower relative rating:
 - Q4: Quantity of IAC meetings
 - Q5: Adequacy of training, tools, education, and support provided
 - Q12: Effectiveness of IAC performance and contribution assessment

Results less conclusive on whether these areas are weaknesses and may need further assessment.

Questions?

Public Agenda Item #7c

Review and Discussion of the Investment Advisory Committee

7c. Board of Trustees Survey of the IAC

February 22, 2017

Tom Tull, CFA, Chief Investment Officer

Board of Trustees Survey of the IAC



Agenda

- We have completed the Board's survey regarding the IAC
- The goal of this survey was to:
 - Gauge effectiveness of the IAC
 - Obtain critical feedback from the Board regarding the IAC
- Goal for today:
 - Provide an overview of the survey results
 - Discuss the various perspectives

Board of Trustees Survey of the IAC

Overview of Average Responses



Observations

- *Question 1 and 3*, understanding of ERS' mission and goals and awareness of risk and reward factors, received the highest ratings
- *Question 4*, preparedness, understanding, and engagement, received the lowest relative rating, it was still rated highly so no one disagreed on this point.

Board of Trustees Survey of the IAC

Understanding of ERS Investment Program

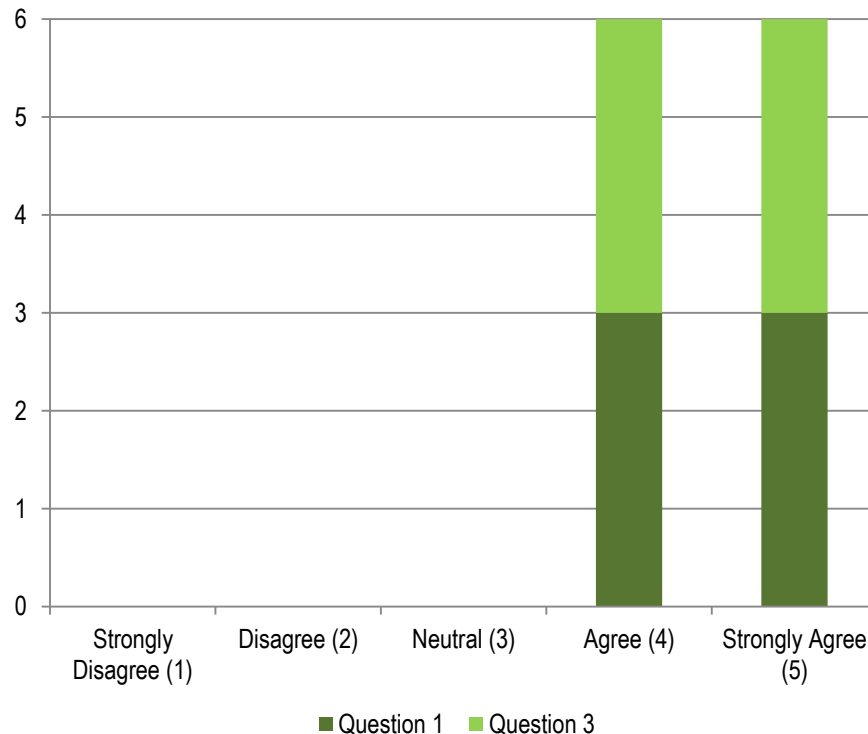


- Observations

- Most strongly agree that IAC understands the ERS Investment Program and relevant duties/requirements

Q1: Understanding and incorporation of ERS' mission and goals when advising staff

Q3: Cognizance of risk and reward factors



Board of Trustees Survey of the IAC

Effectiveness



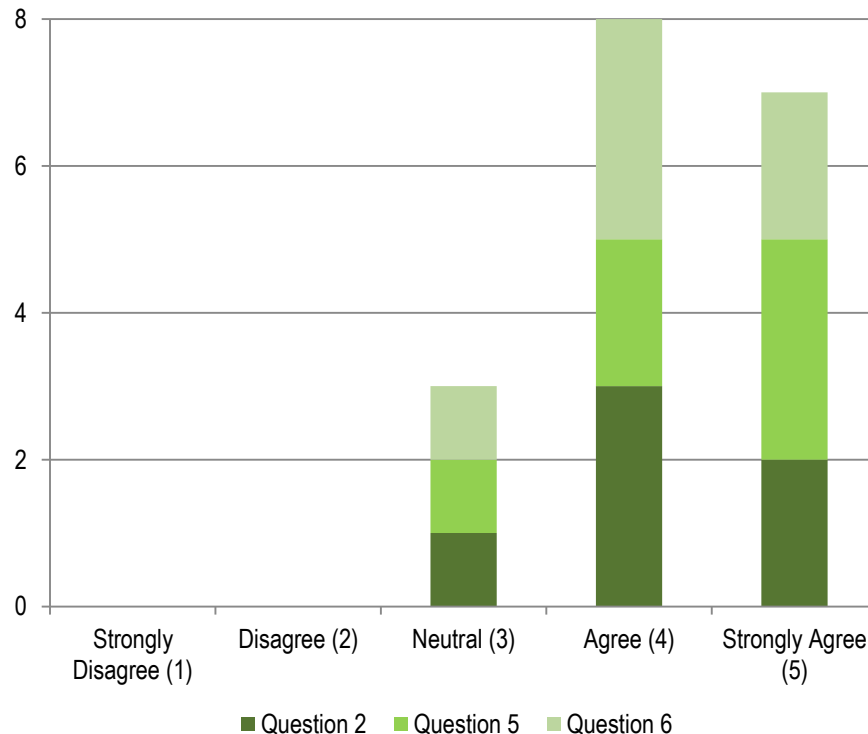
- Observations

- All strongly agree or agree that the IAC is effective at advising the Investment Program

Q2: Effectiveness of direction/expertise

Q5: Effectiveness of IAC contributions

Q6: Effectiveness of IAC guidance and direction on asset allocation strategies



Board of Trustees Survey of the IAC

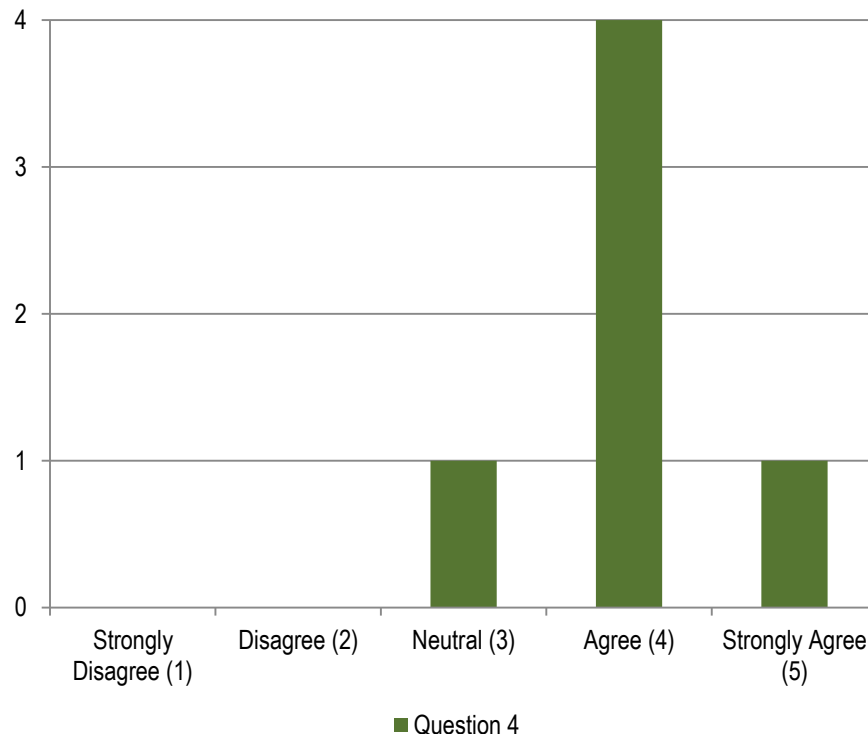
Preparedness, Understanding, and Engagement



- Observations

- Most agree or strongly agree that the IAC is prepared, understands, and engages with the Board in advising on the Investment Program

Q4: IAC members are prepared, understand investment practices, and interact meaningfully



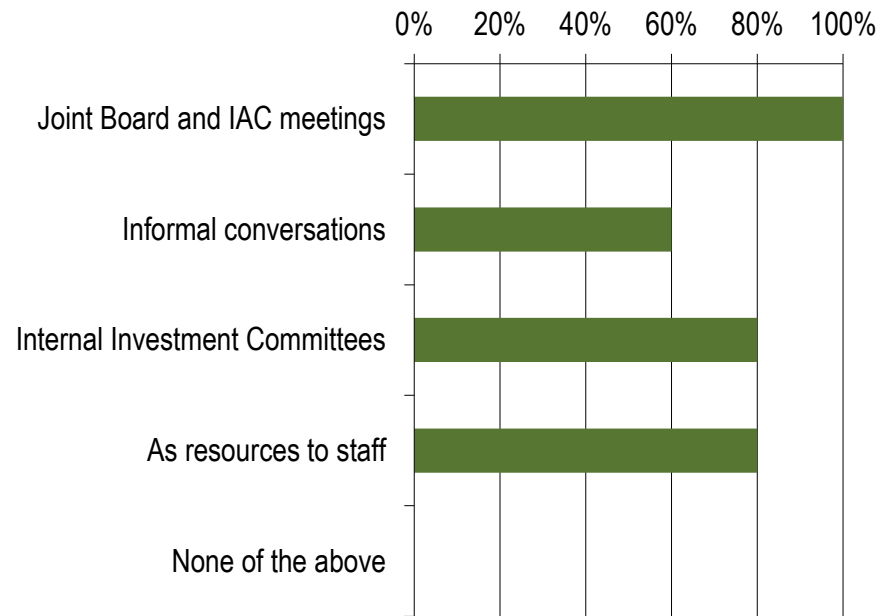
Board of Trustees Survey of the IAC

IAC Helpfulness



In which of the following situations do you find the IAC helpful?

- Observations
 - All respondents find the IAC helpful during formal Joint meeting discussions
 - Many respondents find the IAC helpful in other situations as well as noted



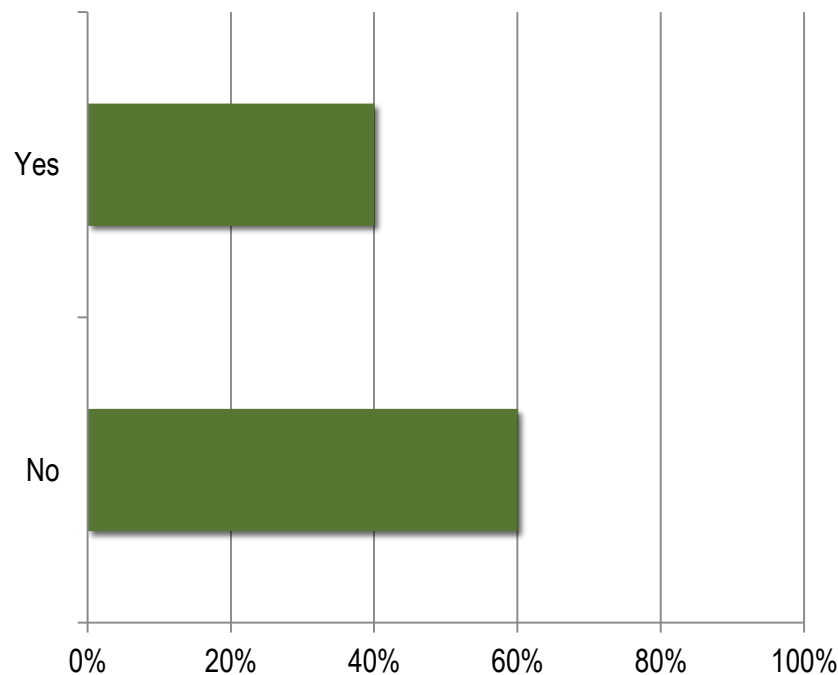
Board of Trustees Survey of the IAC

Other Interactions between the Board and IAC



- Board Comments
- “Should they have a joint committee report to give the board?”
- “[Should there be] executive sessions with IAC to see if they have anything that should be brought to the board's attention.”

8. Are there other interactions that you as Board members would like to have with the IAC?



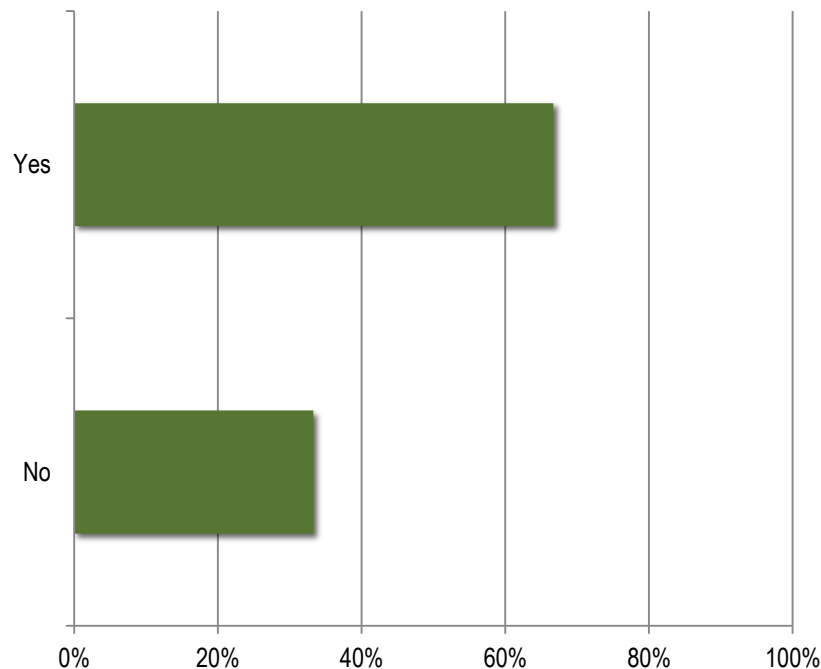
Board of Trustees Survey of the IAC

Additional IAC Expertise



- Board Comments
- More expertise in:
 - Utilization of derivatives and infrastructure investing
 - Alternative investments
- Using less lingo and jargon

Are there any additional areas of expertise that you would find useful as an IAC resource in Investments?



Board of Trustees Survey of the IAC

IAC and the Asset Allocation Study



12. How can the IAC be most useful to you as a Board member as we conduct the asset allocation study?

- Board Comment

“The board needs the IAC's full engagement, best thinking, and input on the reasonableness of expected returns and the appropriate asset allocation/risk-return trade-off to achieve competitive returns and keep the Trust actuarially sound.”

Board of Trustees Survey of the IAC

Review



Results strongly indicate:

- The Board's appreciation of the IAC understanding of their purpose and responsibility.
- The Board's utilization of the IAC for asset allocation and other investment discussions.

Questions?

Public Agenda Item #8

Review and Discussion of the Investment Performance
for 4th Calendar Quarter of 2016

February 22, 2017

Sharmila Kassam, CPA, Deputy Chief Investment Officer
Kristen Doyle & Steve Voss, Aon Hewitt

ERS Trust Fund Dashboard

Performance

Fund	<u>CYTD</u>	<u>FYTD</u>
Performance:	6.3%	1.5%
Benchmark:	7.4%	1.1%
Excess Return:	-1.1%	0.4%
3-Yr Tracking error		1.40

Largest Contributors (quarter):

- Outperformance of the global public equity component
- Outperformance of the private equity portfolio
- **Largest Detractors (quarter):**
- Manager performance within the international equity component
- Slight overweight to cash

Profile

Market Value at 12/31/16:

\$25.6 Billion

Actuarial Accrued Liability 8/31/16:

\$35.3 Billion

Retirees and Beneficiaries 8/31/16:

103,758

Retirement Payments Annually 8/31/16:

\$2.1 Billion

ERS Trust Funding Ratio 8/31/16:

75.2%

Compliance

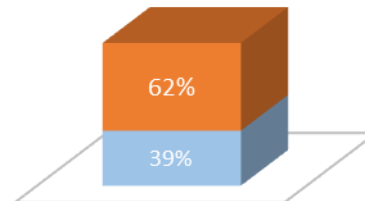
Asset Allocation Compliance: Yes

Tracking Error Compliance: Yes

Investment Policy Compliance: Yes

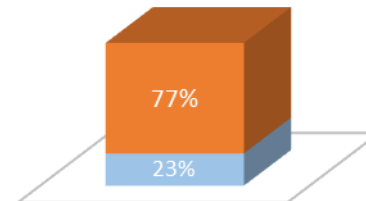
MANAGEMENT

■ External ■ Internal



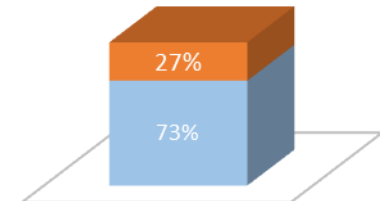
ALLOCATION

■ Risk Reducing ■ Return Seeking



LIQUIDITY

■ Liquid ■ Illiquid

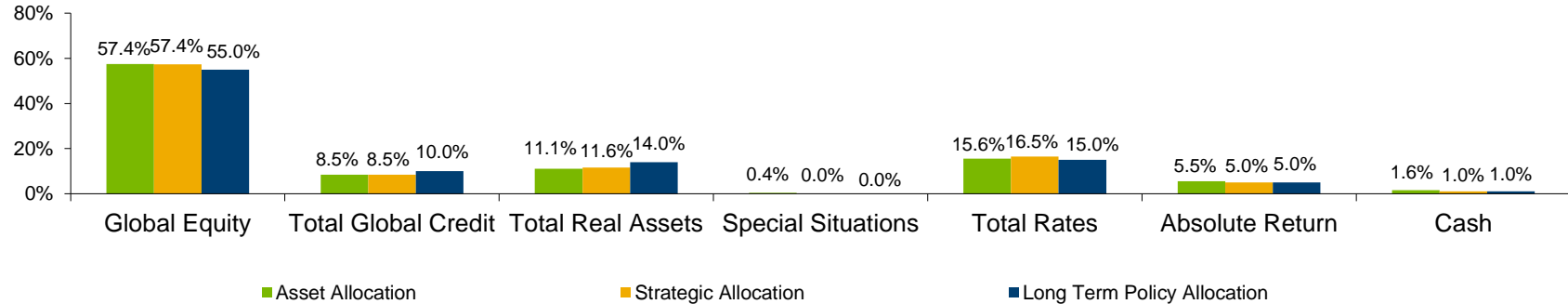


Total Fund: Asset Allocation

Summary of Cash Flow

Total Fund	1 Quarter	Fiscal YTD	1 Year
Beginning Market Value	25,570,386,973	25,499,105,144	24,891,929,422
+ Additions / Withdrawals	-251,585,923	-332,071,873	-902,796,202
+ Investment Earnings	271,772,123	423,539,903	1,601,439,954
= Ending Market Value	25,590,573,174	25,590,573,174	25,590,573,174

Employees Retirement System of Texas - Quarterly Asset Allocation Including Risk Management vs. Policy Target as of 12/31/2016

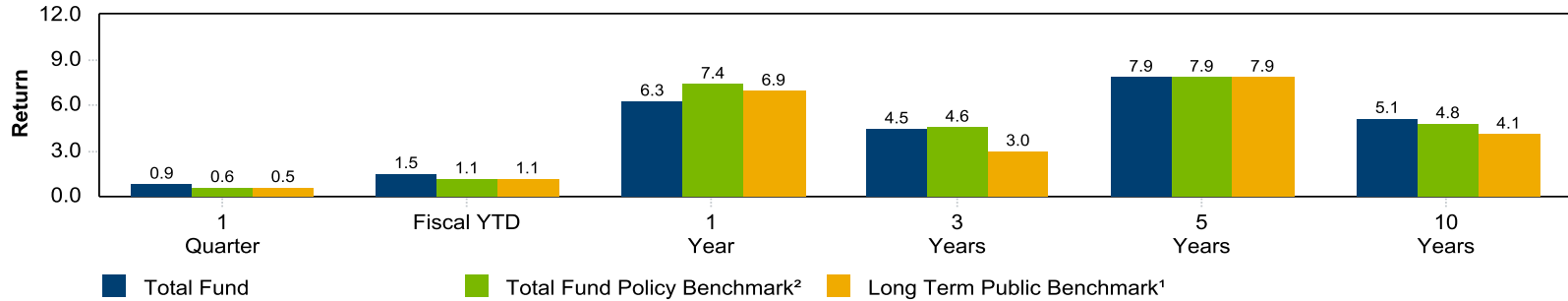


¹ All returns contained in this report are shown net of investment management fees. All returns longer than 1-year are annualized.

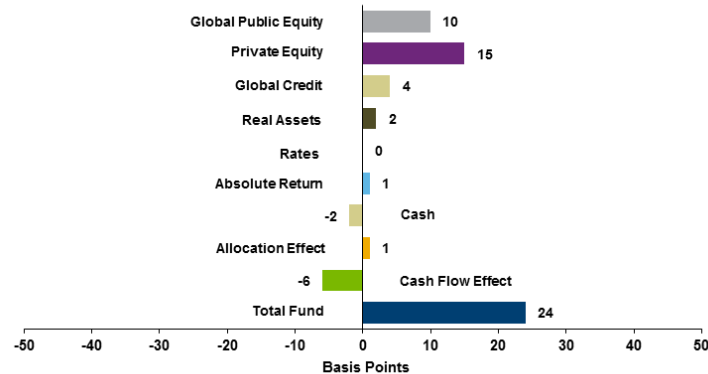
² Source data can be found on pages 31 and 40 of full report.

Total Fund: Performance

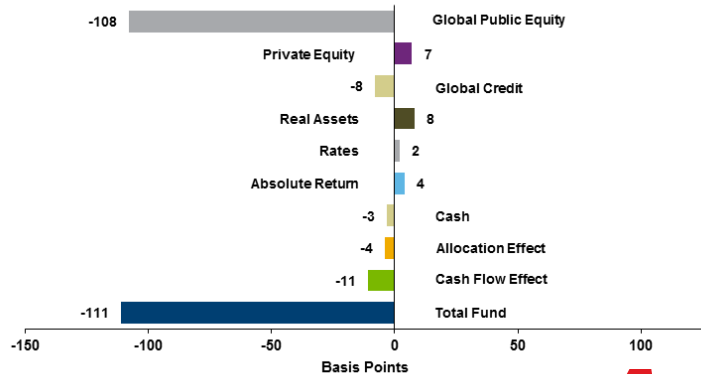
Return Summary



Total Fund Attribution Analysis 3 Months Ending 12/31/16



Total Fund Attribution Analysis 1 Year Ending 12/31/16

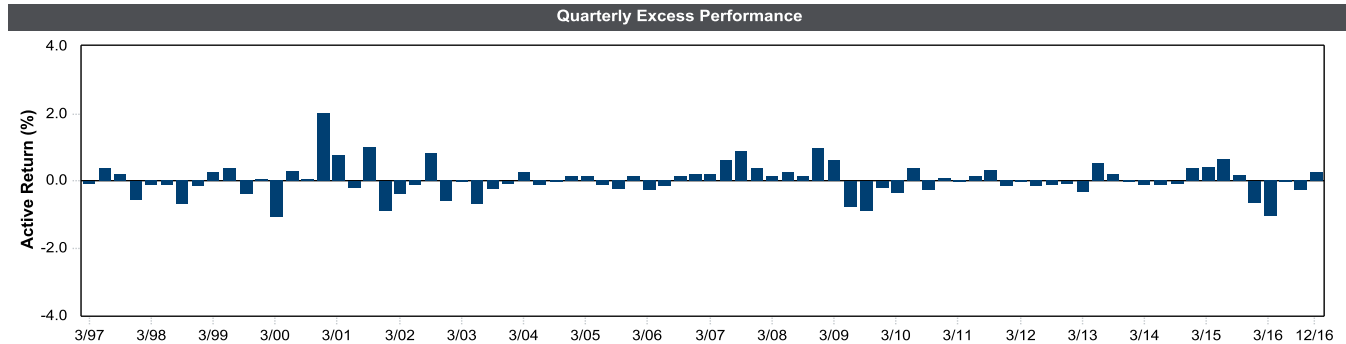
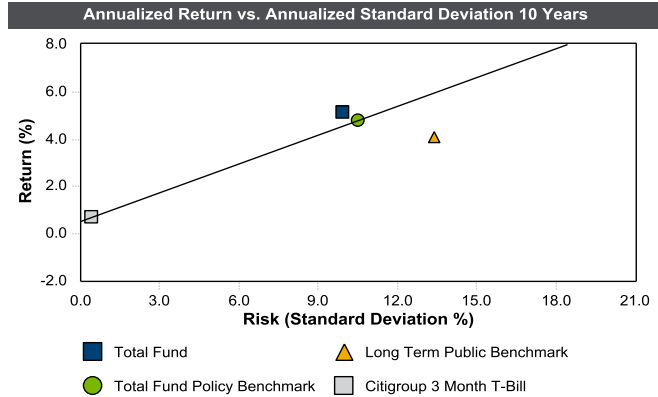
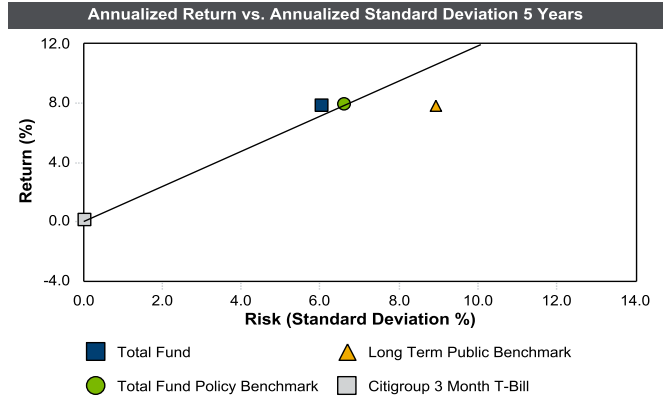


¹The Long Term Public Benchmark is a combination of 79% MSCI ACW IMI and 21% Barclays Intermediate Treasury Index.

²A detailed description of the Policy Index as of 12/31/2016 is provided in the appendix of the full report.

³Source data can be found on pages 30 and 32 of full report.

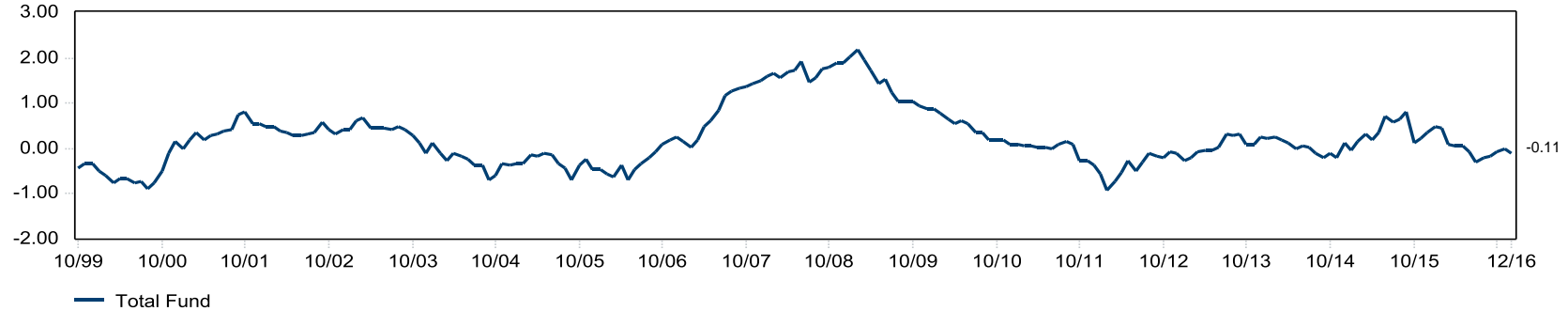
Total Fund: Risk



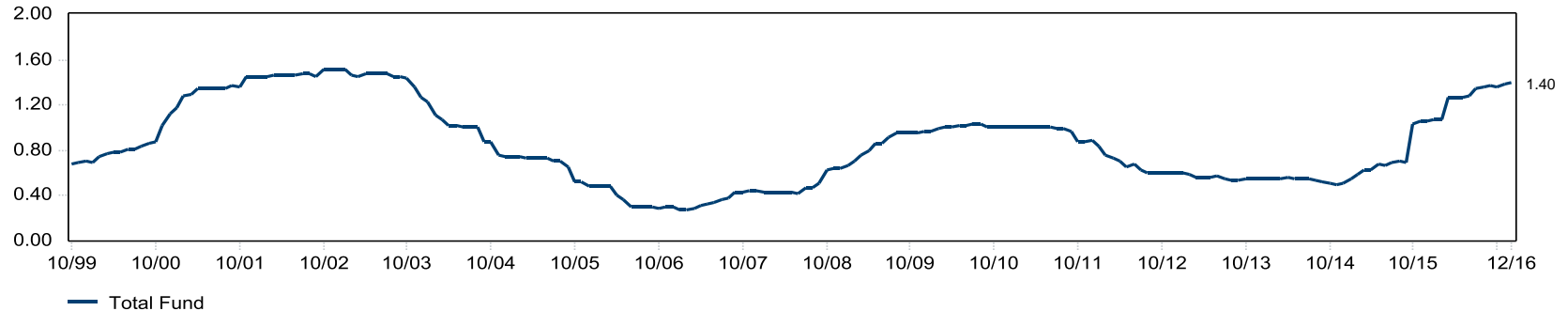
¹ Source data can be found on page 32 and 39 of full report.

Total Fund: Rolling Information Ratio and Tracking Error (36 months)

Information Ratio (Excess Return Ratio¹)



Tracking Error²

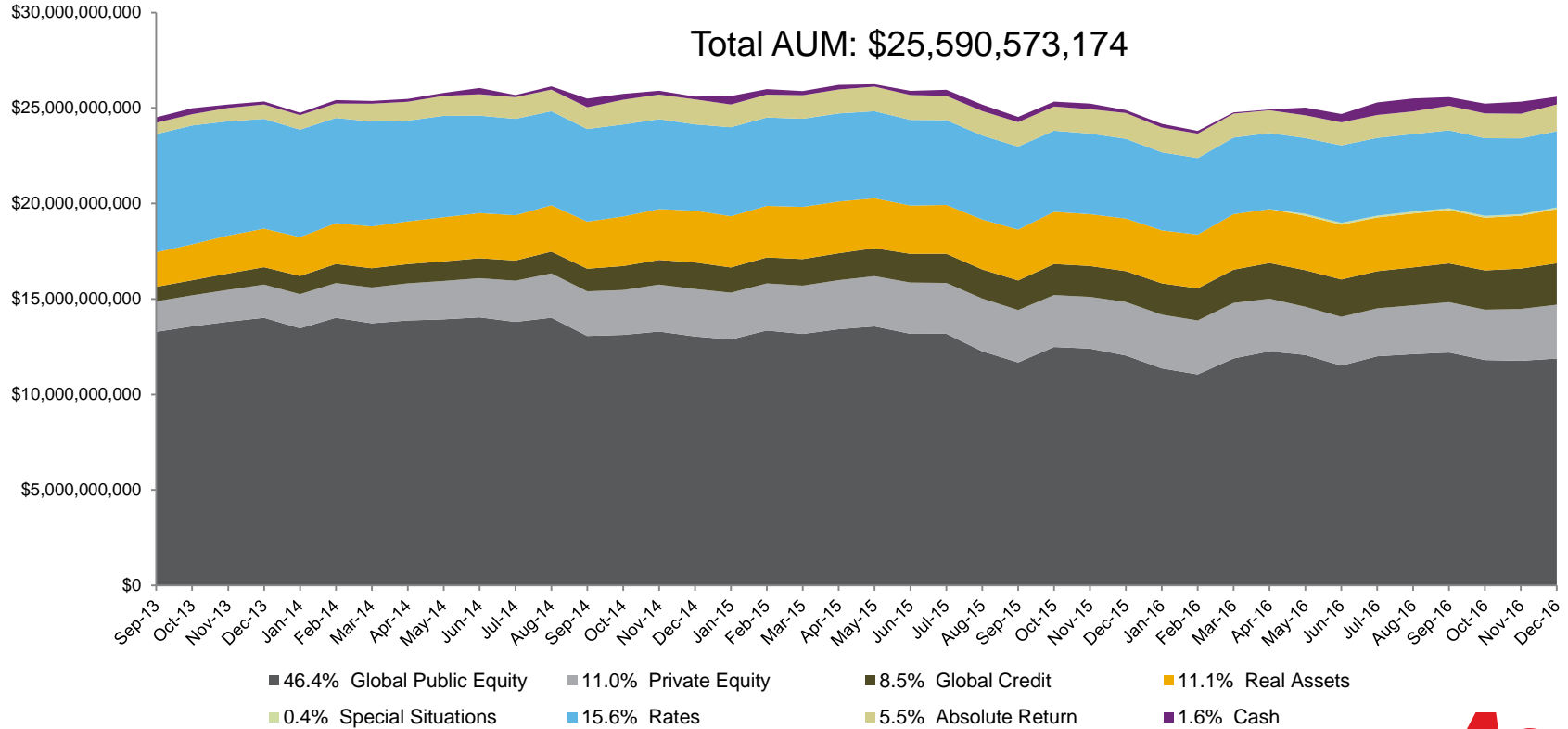


¹ Measured by dividing the active rate of return by the tracking error. The higher the Information Ratio, the more value-added contribution by the manager.

² A measure of the standard deviation of a portfolio's performance relative to the performance of an appropriate market benchmark.

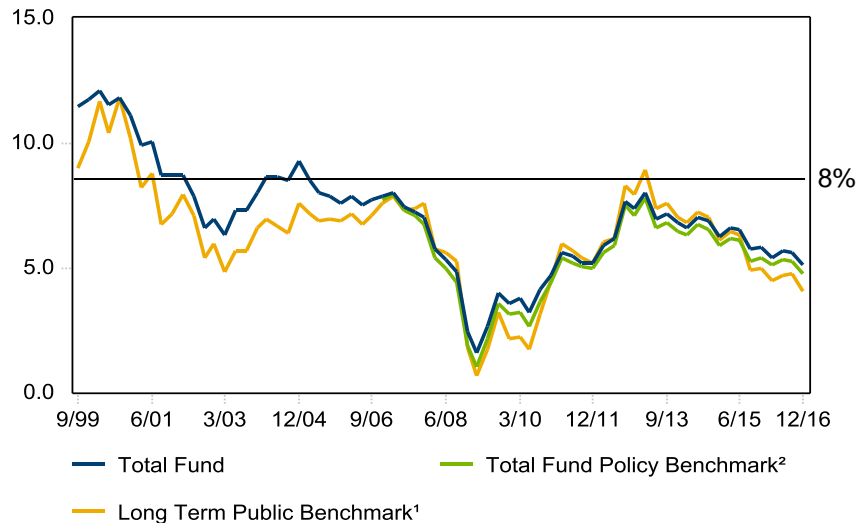
ERS Asset Allocation Evolution

Total AUM: \$25,590,573,174

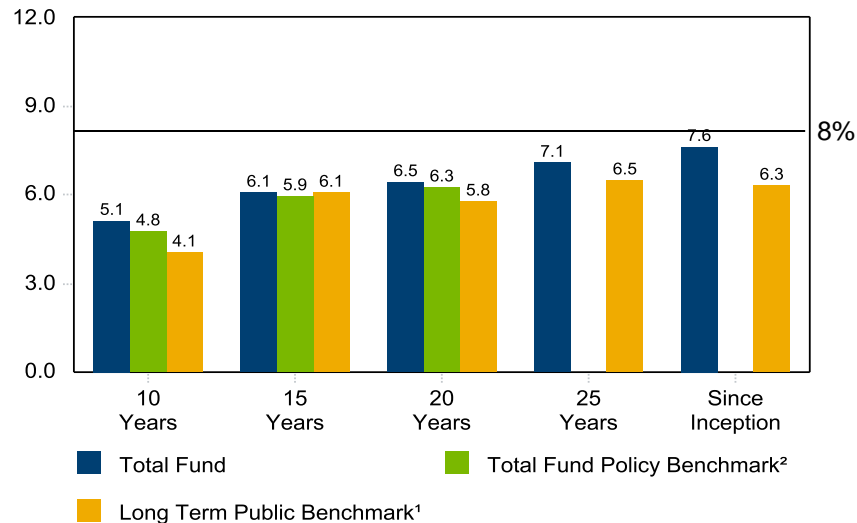


Long Term Investment Results

Rolling 10 Year Return



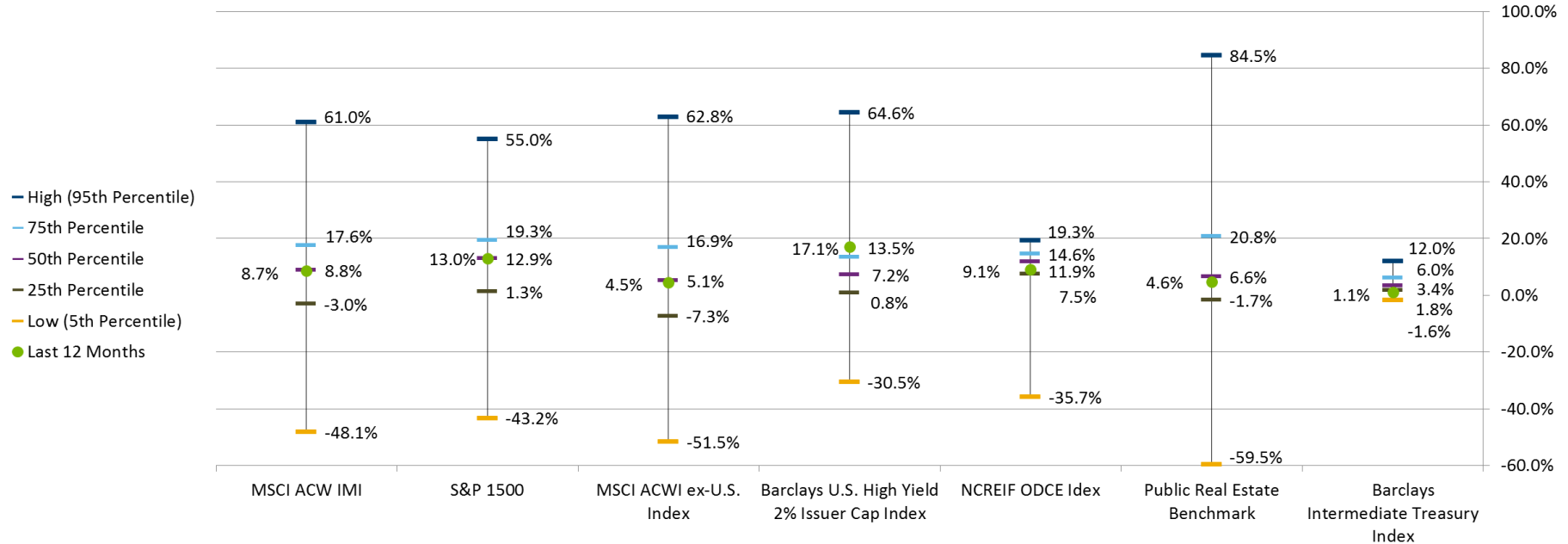
Return Summary



¹The Long Term Public Benchmark is a combination of 79% MSCI ACW IMI and 21% Barclays Intermediate Treasury Index.

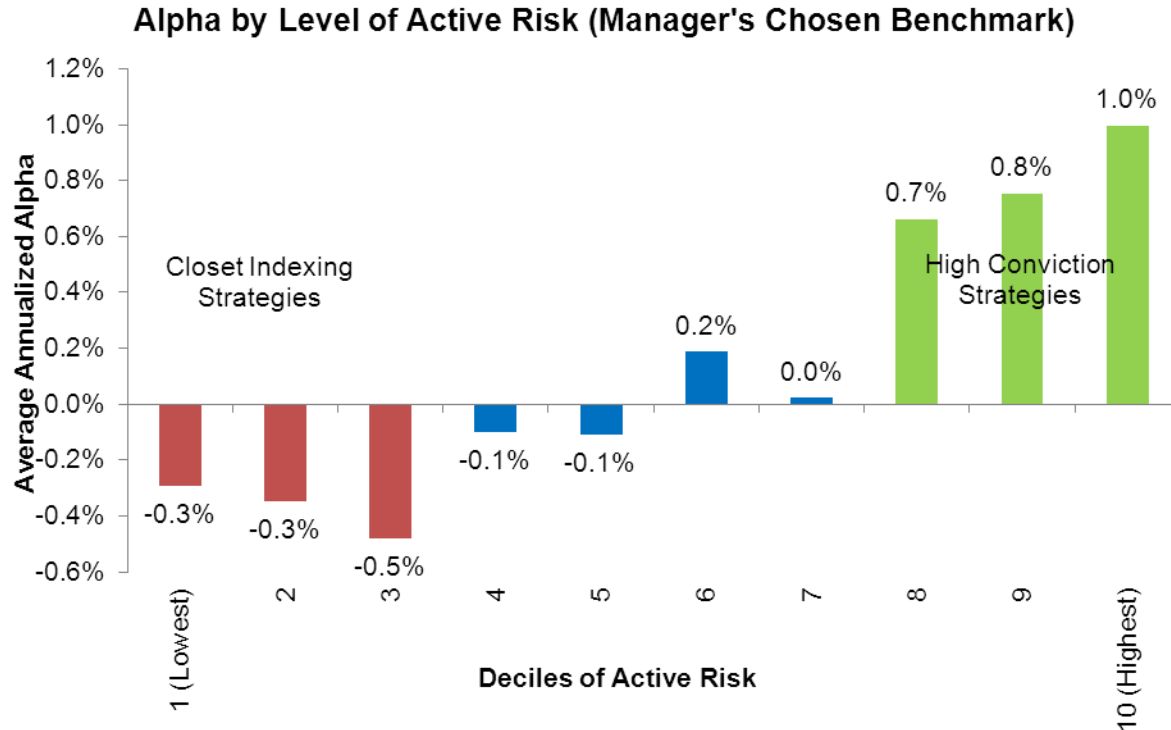
²The Total Fund Policy Benchmark has an inception date of 11/30/1996.

Rolling 12-Month Capital Market Returns (10 Years ending 12/31/16)



- The chart above depicts the dispersion of rolling 12 month returns of various capital markets over the last 10 years.

Increasing Success in Active Management

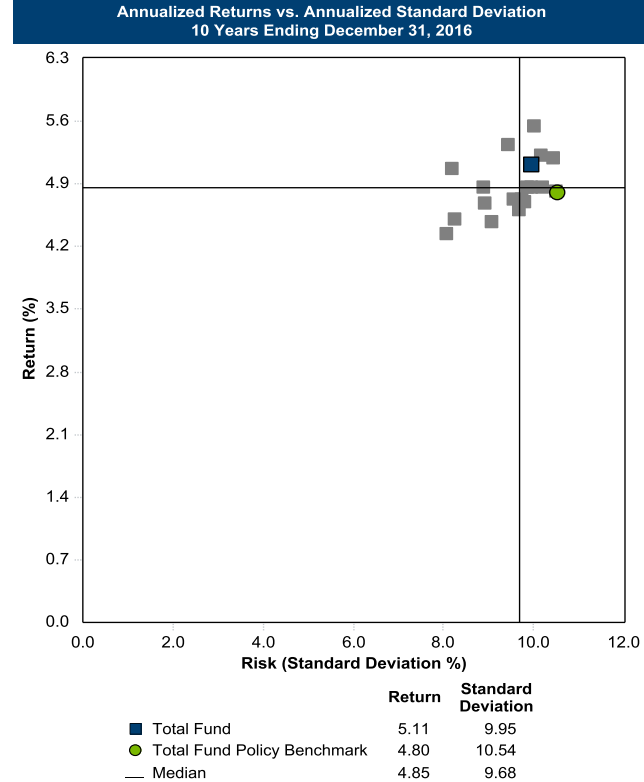
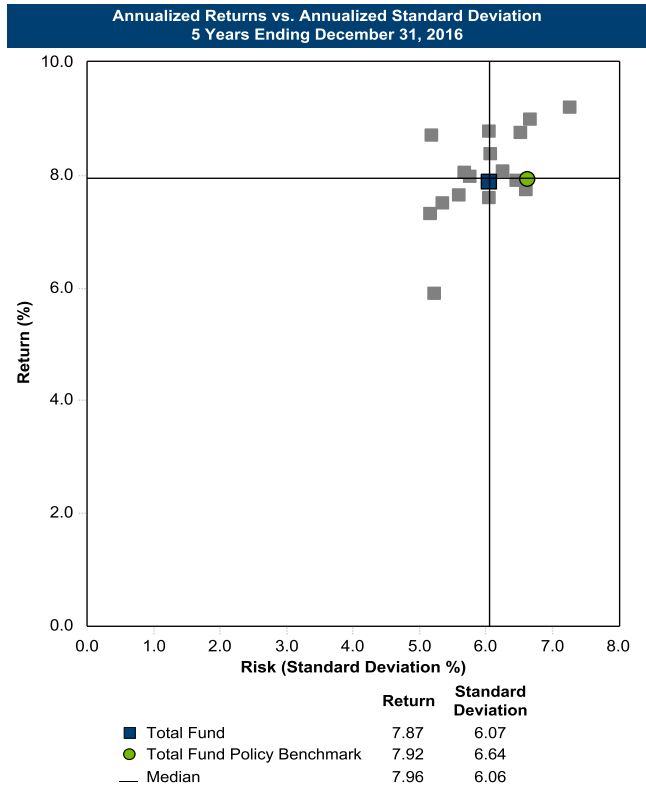


- Our research finds a strong link between active risk and performance relative to the benchmark
- Evidence of true skill is much stronger among the most active managers
- We recommend clients combine low cost indexing (or low cost internal management) with high-conviction active strategies and avoid the expensive diversification of low active risk strategies and multitudes of actively managed portfolios
- Due to the economies of scale ERS can access low cost diversification through its internally managed portfolios

*Aon Hewitt's research, "Conviction in Equity Investing," evaluation of 3,494 funds using the performance period of 2003 - 2011

Risk Adjusted Performance Relative to Peers

All Public Plans > \$10B - Total Fund



Summary Analysis

- Public equity underperformance has been the largest detractor from Total Fund results during the trailing 12 month period.
 - CY2016 was an extremely difficult period for active management.
 - Over Q4 of 2016, the public equity component added 10 bps of relative performance.

- Longer term investment results continue to be generally positive, the Total Fund has produced risk adjusted returns superior to the benchmark and the Long Term Public Benchmark over the five and ten year period.
 - The Total Fund matched the benchmark over the trailing five year period, at a lower risk level (volatility).
 - Over the trailing ten year period the Total Fund has outperformed the benchmark by 30 bps with lower risk.

- Diversification has been effective, the Total Fund Policy Benchmark has produced a return superior to the Long Term Public Benchmark at a meaningfully lower level of risk (volatility) over the trailing five and ten year period.

Questions?

Public Agenda Item #9a

Review and Discussion of Global Public Equity Program:

9a. Market Update and Program Overview

February 22, 2017

John Streun, MS, CFA, CPA, Director of Global Public Equity

Chris Tocci, CFA, Deputy Director of Global Public Equity

Tim Reynolds, MS, CFA, CAIA, Supervising Portfolio Manager

Neil Henze, CMT, Chief Equity Trader

Global Public Equity Program

Agenda



- Investment Objective and Public Equities Team update
- 2016 in Review – A difficult year for Active Management
- Recent Changes
- Portfolio Structure and Positioning
- Internal Risk Management
- Major themes and outlook for 2017
- Best Ideas Portfolios
- Trading Update
- Goals and Objectives for 2017

Global Public Equity Program

Investment Objective & Strategy



- Investment Objective – Outperform the Global Public Equity Benchmark Over Rolling Five-Year Periods, While Maintaining Compliance with the Active Risk Budget.
- Investment Strategy – Combine Lower Risk Internal Strategies with Higher Risk External Strategies to Produce a Stable Excess Return with a Target Tracking Error of 150 Basis Points and an Excess Return Ratio of 0.25 or Better.

Global Public Equity Program

Public Equity Team



Public Equity Team

Leadership: John Streun, Chris Tocci, Andrew Hodson, Tim Reynolds, Neil Henze

Domestic Portfolio Managers

<u>S&P 500</u>	<u>Large Cap Active</u>	<u>Large Cap Growth</u>	<u>Mid Cap</u>	<u>Small Cap</u>
Bob Wood MBA, CFA (27)	Kelley Hewell MBA, CFA (24)	Kelley Hewell MBA, CFA (24)	Andrew Hodson MBA, CFA (15)	Brent Clukey MBA, CFA (21)

International Portfolio Managers:

<u>Europe</u>	<u>Asia</u>	<u>Emerging Markets</u>	<u>Canada</u>
Chris Tocci, CFA (25)	Keith Lyons, MBA (13)	Tim Reynolds MS, CFA, CAIA (25)	Stuart Williams MBA, CFA (26)

Quantitative

Stuart Williams, MBA, CFA (26)
Kelley Hewell, MBA, CFA (24)

Trading

Neil Henze, CMT (22)
Michael Clements, CMT (19)
Rob Newhall (4)

External Advisors

Shar Kassam, CPA, Esq. (5)
Lauren Honza, MBA, CFA (23)
Michael McCrary, MBA (16)

Global Public Equity Program

Public Equity Team



Public Equity Structure

Industrials & Materials

John Streun, MS, CFA, CPA (24)

Keith Lyons, MBA (13)

Paul Knight, CFA (15)

Teofilo Bacungan, MBA, CFA (16)

Nancy McCarthy, MBA, CFA (9)

Technology & Telecom

Brent Clukey, MBA, CFA (20)

Chris Tocci, CFA (24)

John Taylor, MBA, CFA (10)

Flavia de la Fuente, MBA (3)

Jake Tisinger, CFA (8)

Consumer

Bob Wood, MBA, CFA (26)

Andrew Hodson, MBA, CFA (15)

Mark Long, MBA, CFA (20)

June Kim (10)

Financial Services

Kelley Hewell, MBA, CFA (24)

Tim Reynolds, MS, CFA, CAIA (24)

Scott Hodgson, CFA (12)

Health Care

Stuart Williams, MBA, CFA (26)

Micheal Yuan, CFA (19)

Energy

Ben Schuman, CFA (11)

ERS Global Public Equity

2016 in Review – A Difficult Year for Active Management

Global Public Equity Program

2016 – A difficult year for active managers



Percentage of Equity Funds Underperforming Benchmark

FUND CATEGORY	ONE-YEAR (%)	THREE-YEAR (%)	FIVE-YEAR (%)
All Large-Cap Funds	84.62	81.31	91.91
Mid-Cap Core Funds	82.48	84.96	87.68
Small-Cap Core Funds	90.78	95.56	97.89
All Domestic Equity Funds	90.20	87.41	94.58
International Funds	54.92	54.55	60.45
Emerging Market Funds	42.22	77.42	67.63

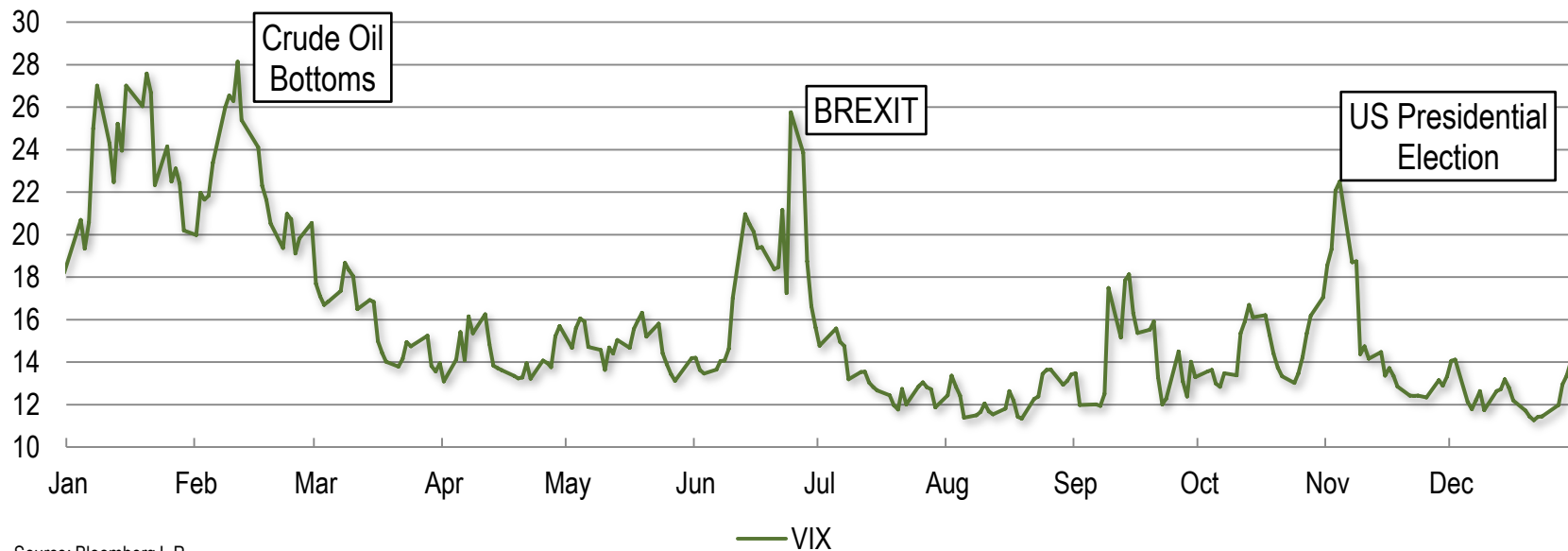
Source: SPIVA U.S. Scorecard

Global Public Equity Program

Macro surprises led to swings in volatility



CBOE Volatility Index 2016



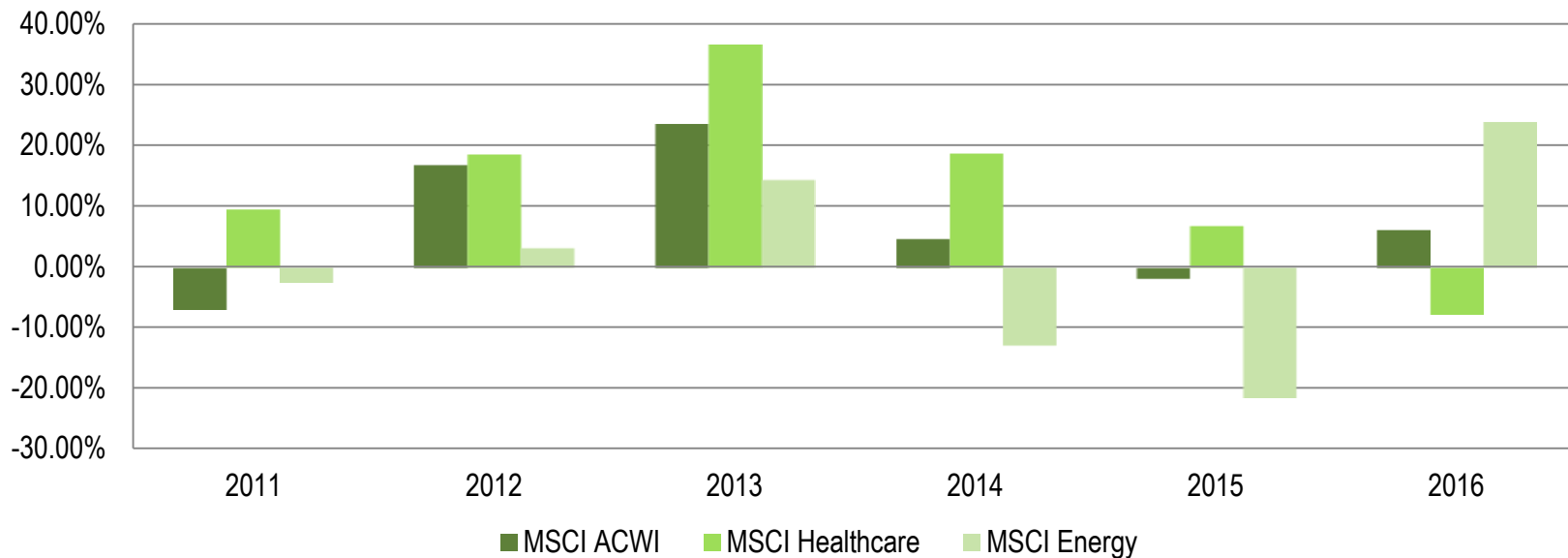
Source: Bloomberg L.P.

Global Public Equity Program

Rotation in sectors and styles was pronounced in 2016



Annual Return by Sector: Healthcare vs Energy vs MSCI ACWI



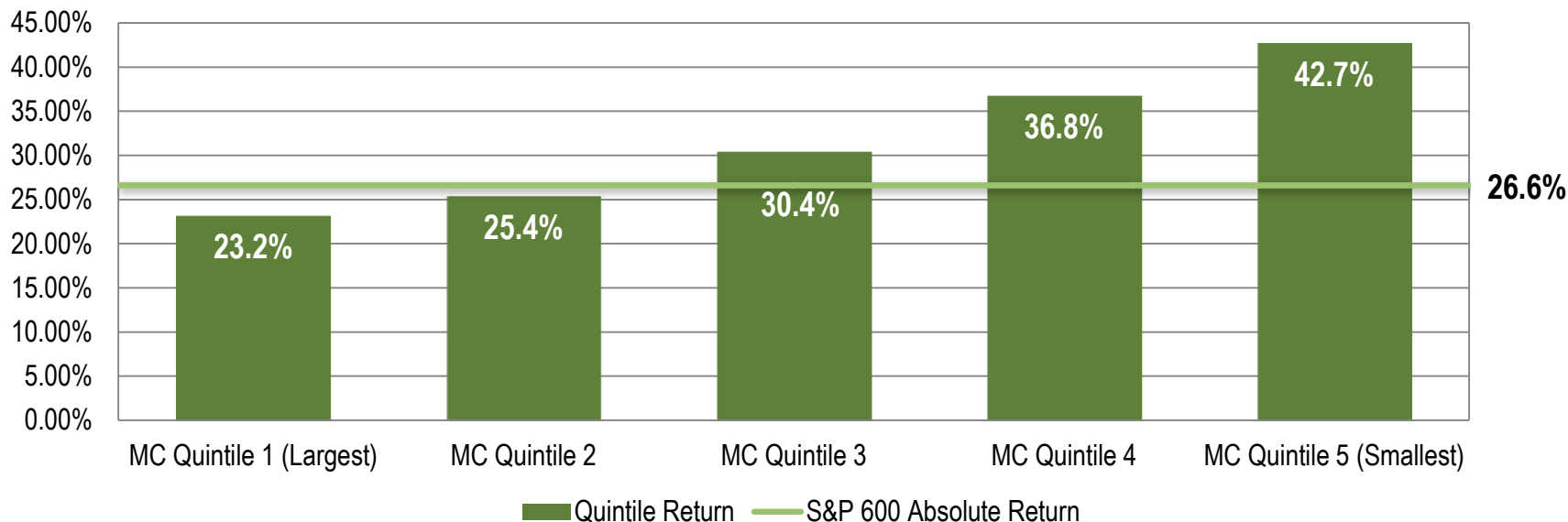
Source: MSCI INC.

Global Public Equity Program

Smaller stocks with less liquidity outperformed



S&P 600 Returns by Market Cap Quintile



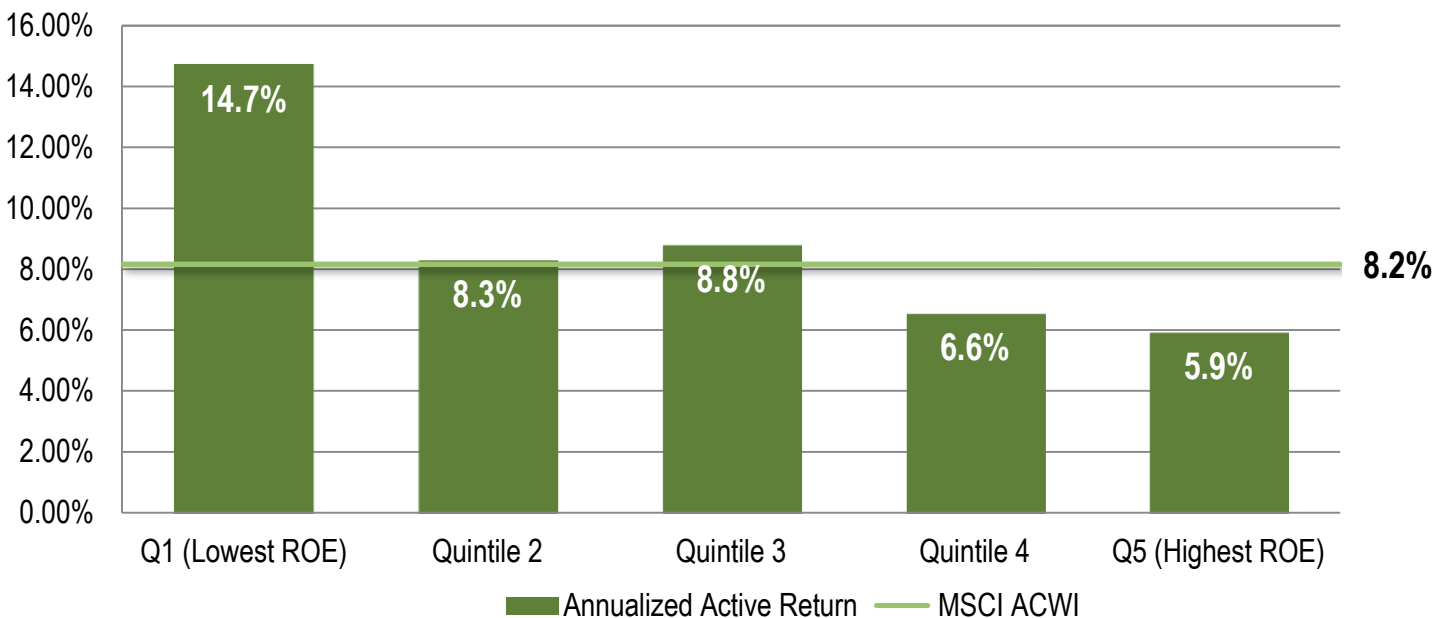
Source: Factset; Standard & Poor's; Jefferies

Global Public Equity Program

Low quality stocks outperformed in 2016



Annualized Active MSCI ACWI Return (%) by ROE Quintile



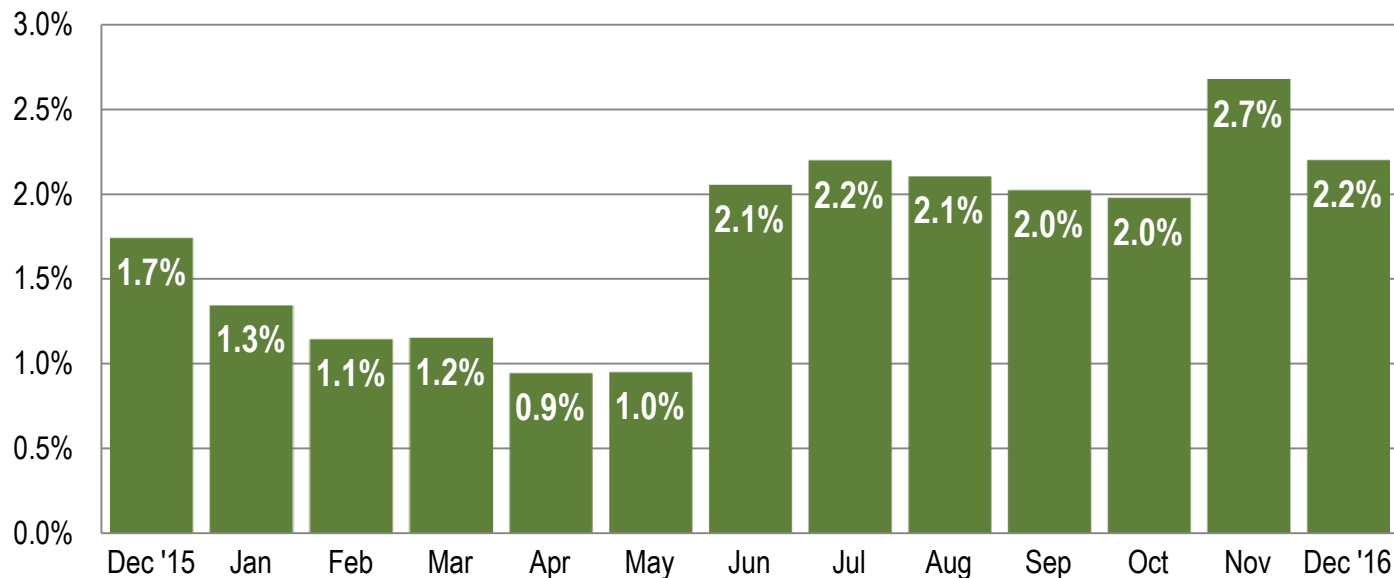
Source: Bloomberg L.P.

Global Public Equity Program

Holding cash hurt relative performance



Cash in Large Cap Fund Holdings (% of Total Assets)



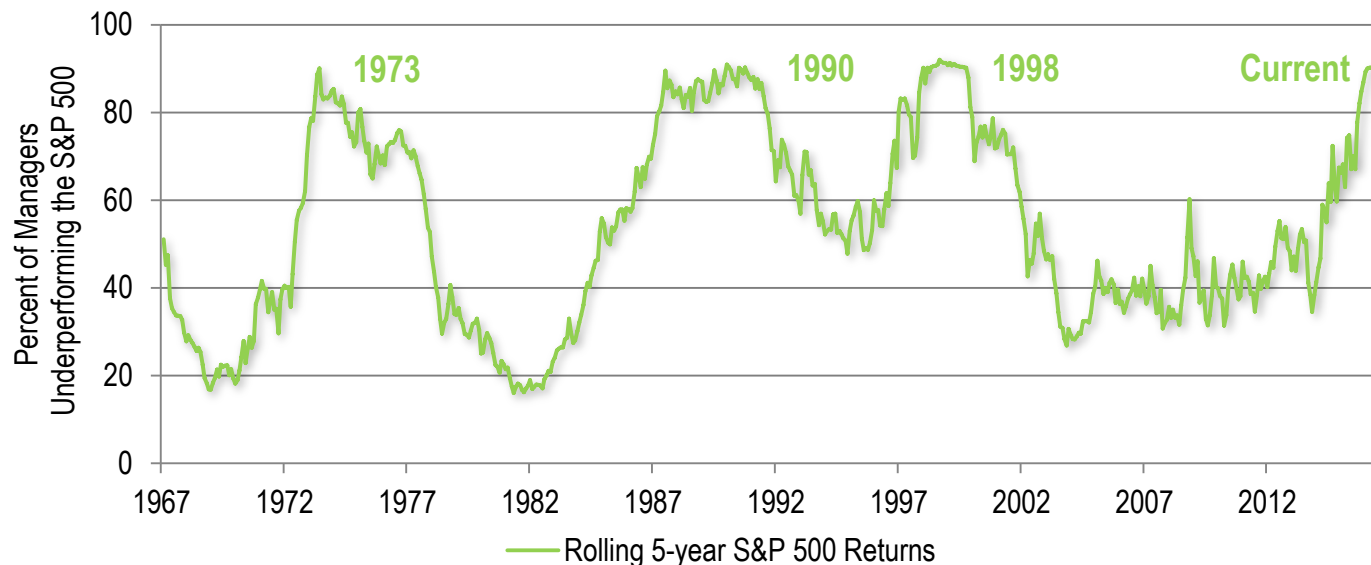
Source: BofA Merrill Lynch US Equity & Quant Strategy

Global Public Equity Program

Performance of active management is cyclical



Ranking of S&P 500 vs Domestic Equity Managers



Source: BofA Merrill Lynch

ERS Global Public Equity

Recent Changes

Global Public Equity Program

Recent Changes



- Reduced risk in certain portfolios
- Selectively moved closer to the benchmark in certain sectors
- Integrated quantitative scores more into our fundamental analysis
- Improved sell discipline
- Changed analyst industry coverage on certain portfolios

ERS Global Public Equity

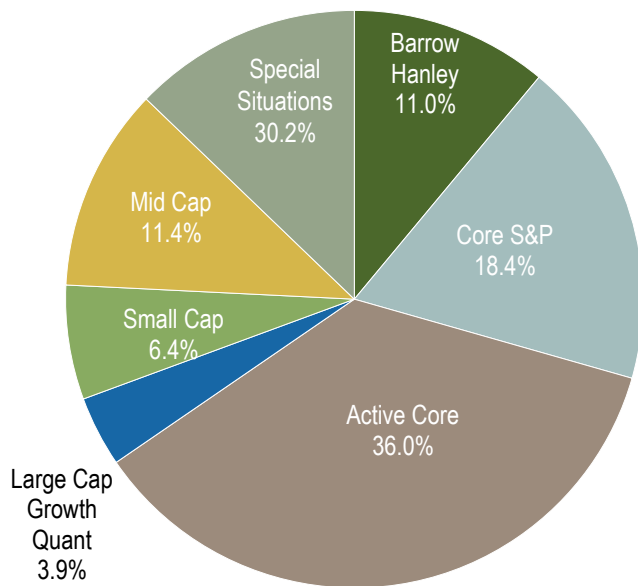
Portfolio Structure and Positioning

Global Public Equity Program

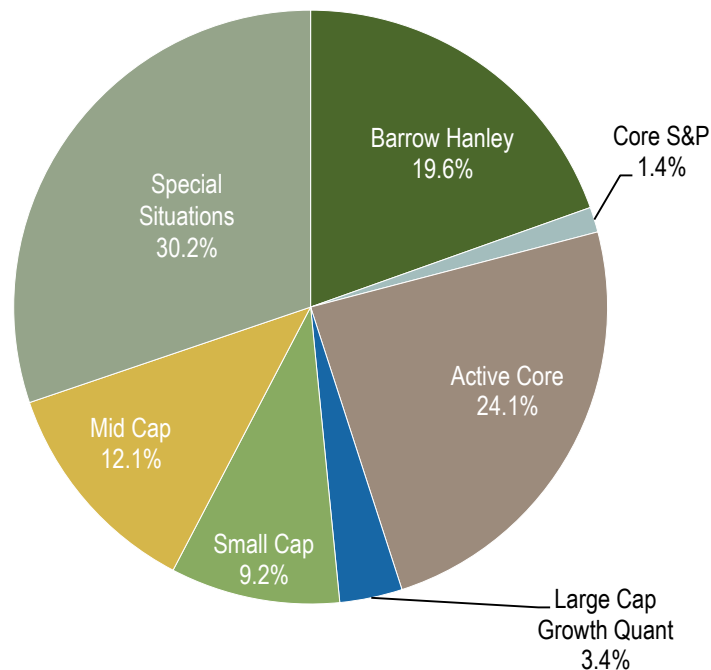
Portfolio Structure and Positioning - Domestic Equity



Domestic Equity - Dollar Allocation (12/31/16)



Domestic Equity - Contribution to Tracking Error, Percent (12/31/16)

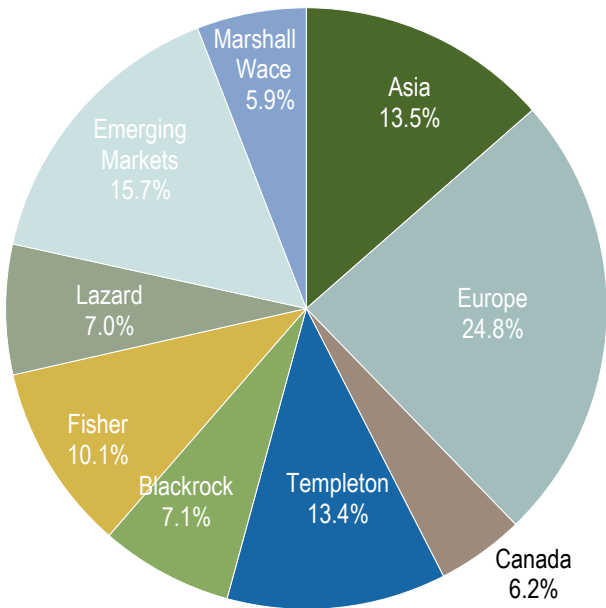


Global Public Equity Program

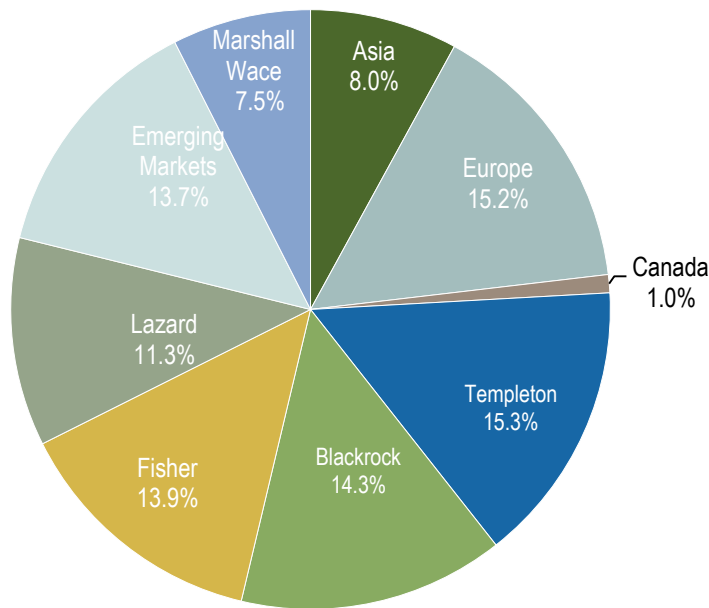
Portfolio Structure and Positioning - International Equity



**International Equity - Dollar
Allocation 12/31/16**



**International Equity - Contribution
to Tracking Error, Percent 12/31/16**



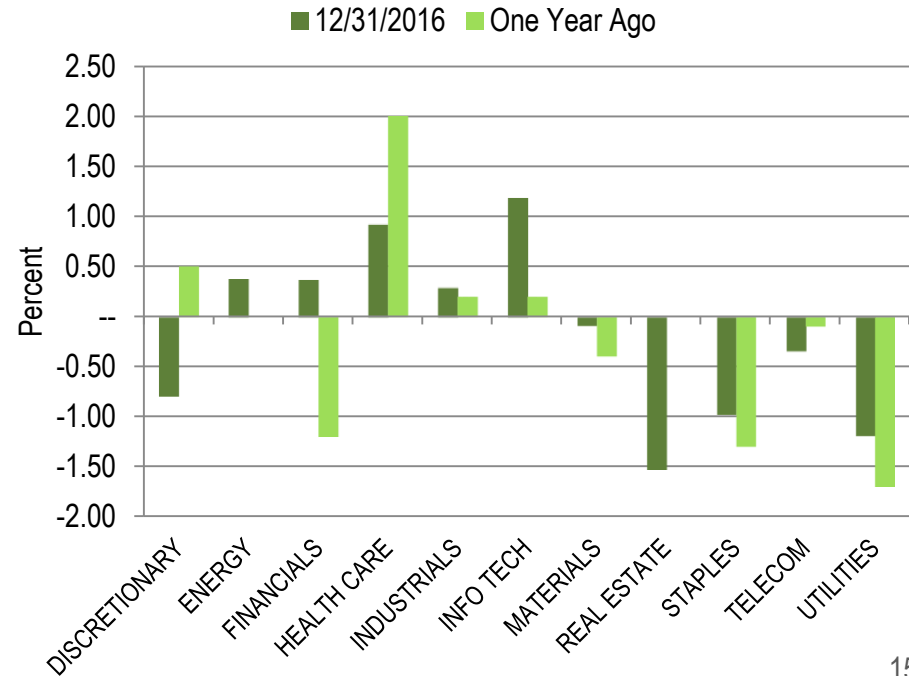
Global Public Equity Program

Portfolio Structure and Positioning - Sector Exposures



- Health Care overweight decreased significantly, offset by an increase in Info Tech
- Discretionary moved from overweight to underweight
- Energy moved to overweight increasing for the second consecutive year

Portfolio Position vs. MSCI AC World IMI by Sector



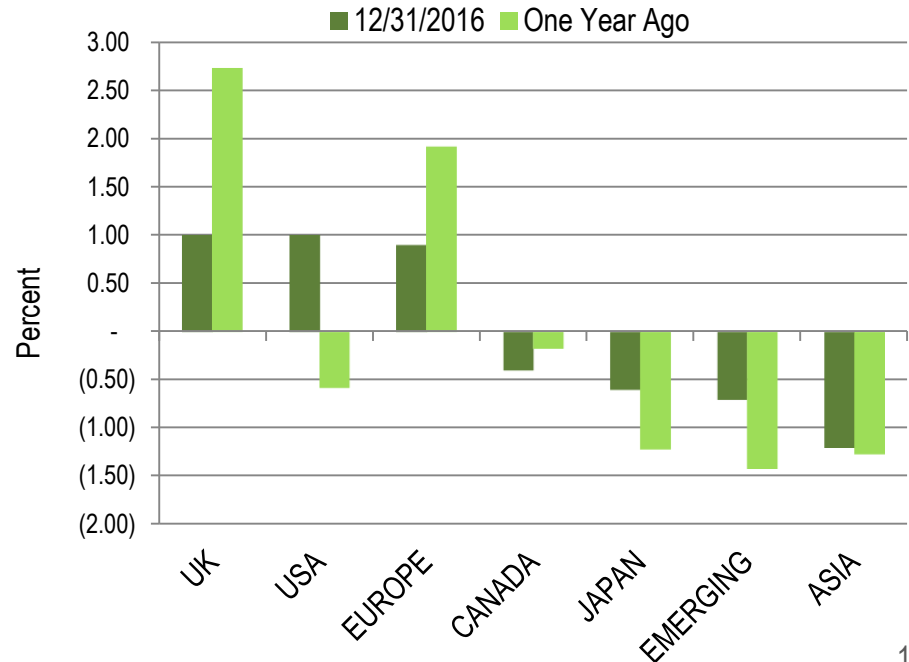
Global Public Equity Program

Portfolio Structure and Positioning - Regional Exposures



- Consensus underweight of Japan and Asia remained in place, though to a lesser extent
- Europe and the UK served as a source of funds as the overweights decreased
- The US was a recipient of capital moving from an underweight to overweight position

Portfolio Position vs. MSCI AC WORLD IMI by Region

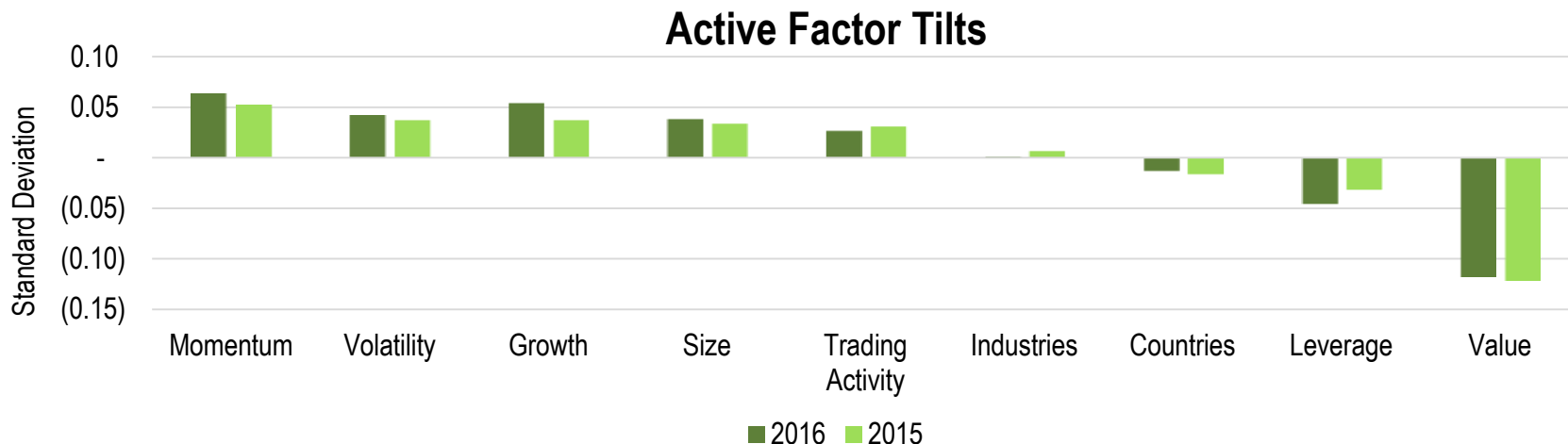


Global Public Equity Program

Factor Exposures (Portfolio Characteristics)



- Factor tilts remain small at the asset class level
- No significant changes in factor tilts between years



ERS Global Public Equity

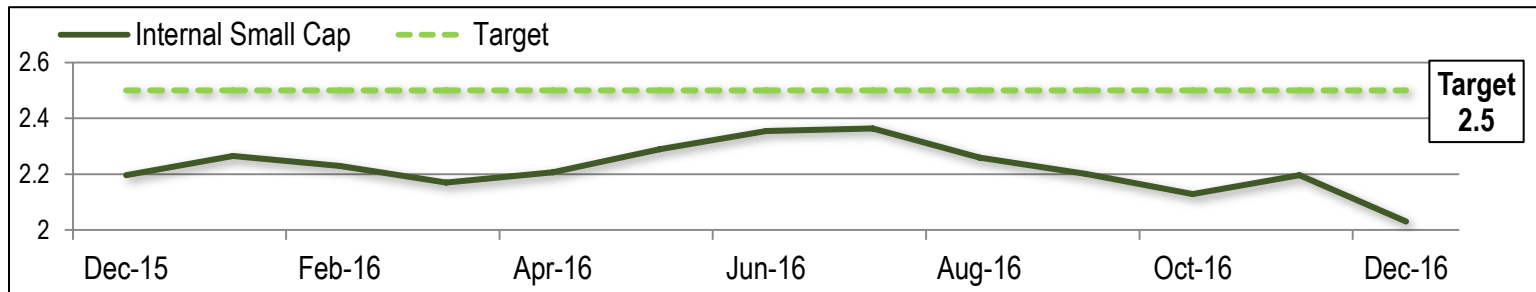
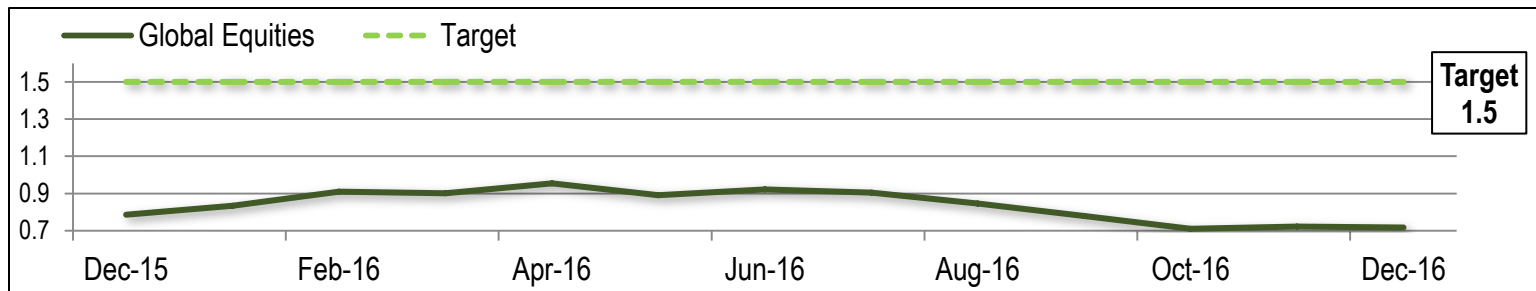
Internal Risk Management

Global Public Equity Program

Active Risk/Tracking Error



- Forecast risk levels remained within policy limits



ERS Global Public Equity

Major Themes and Outlook for 2017

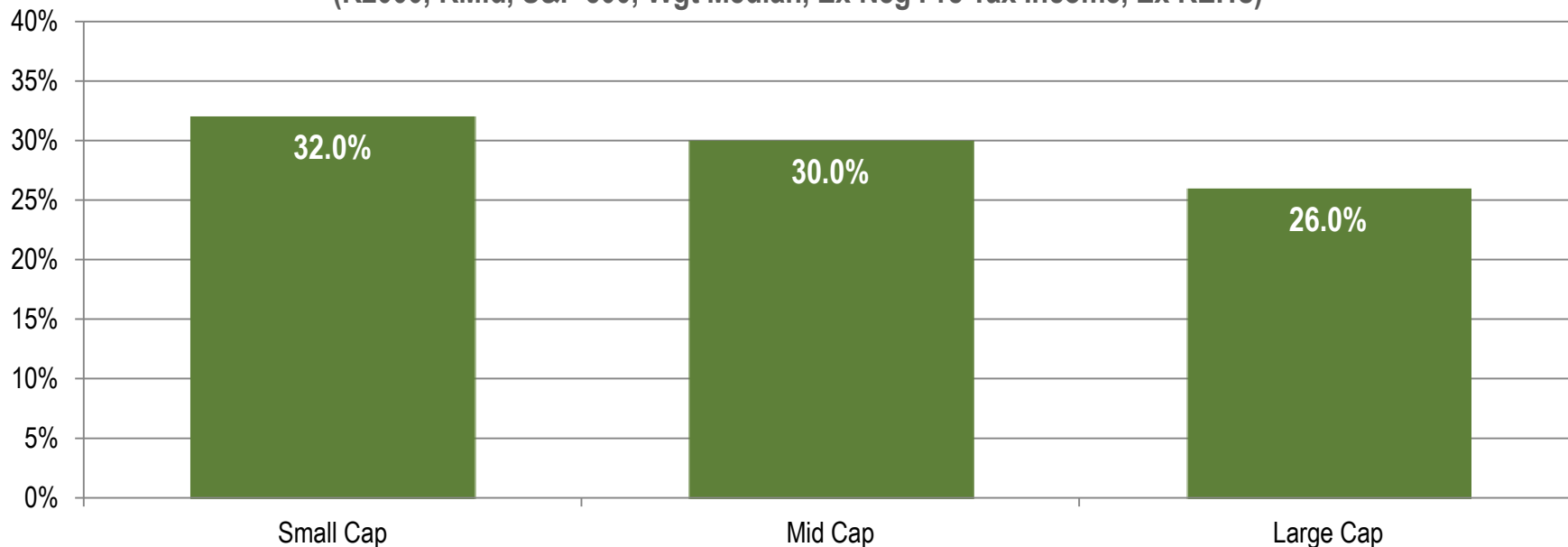
Global Public Equity Program

Lower taxes favor U.S. small cap stocks



Current Effective Tax Rate by Size Index

(R2000, RMid, S&P 500, Wgt Median, Ex Neg Pre Tax Income, Ex REITs)

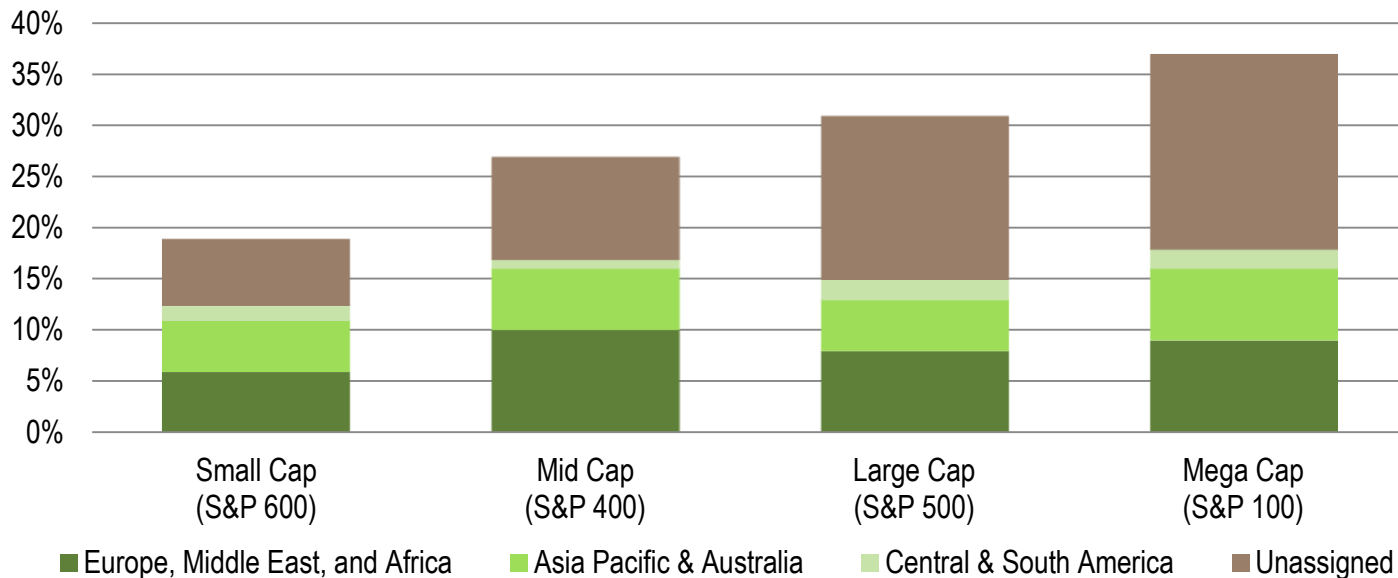


Global Public Equity Program

Small cap stocks benefit from strong domestic demand



International Revenue Exposure for Small, Mid, & Mega Cap
Based on FY 2015 Revenues

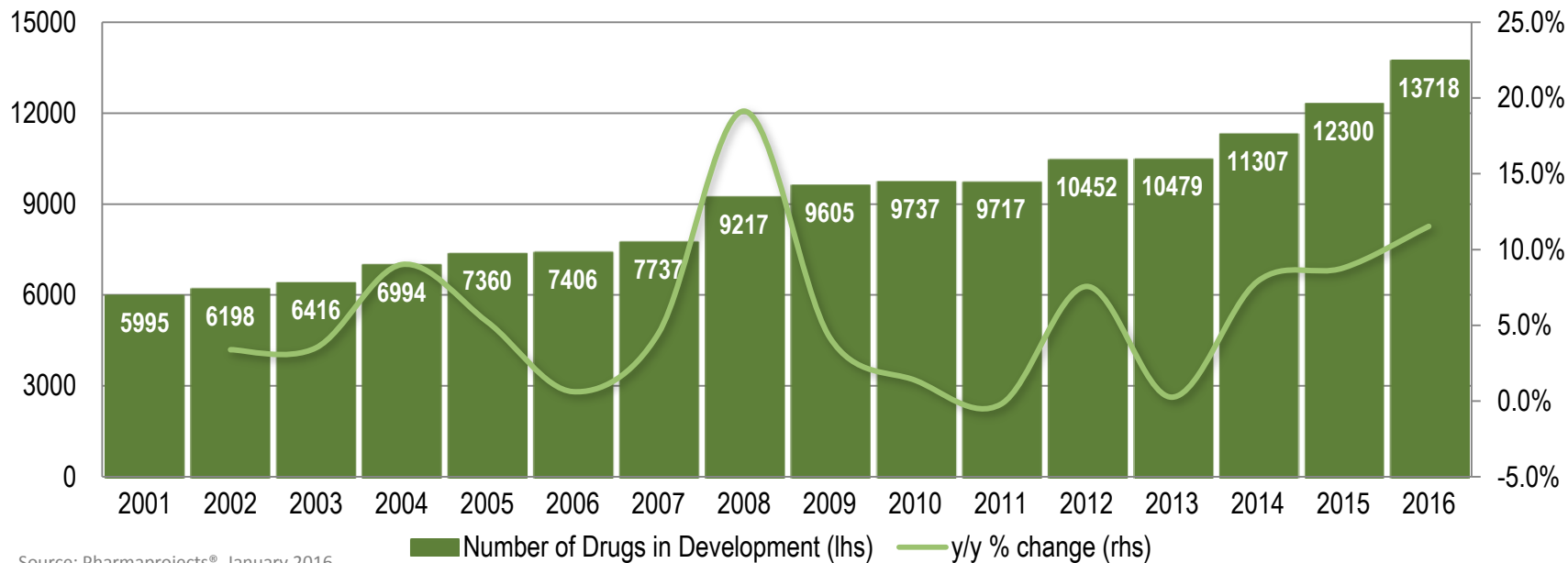


Global Public Equity Program

New drugs should drive earnings growth for healthcare sector

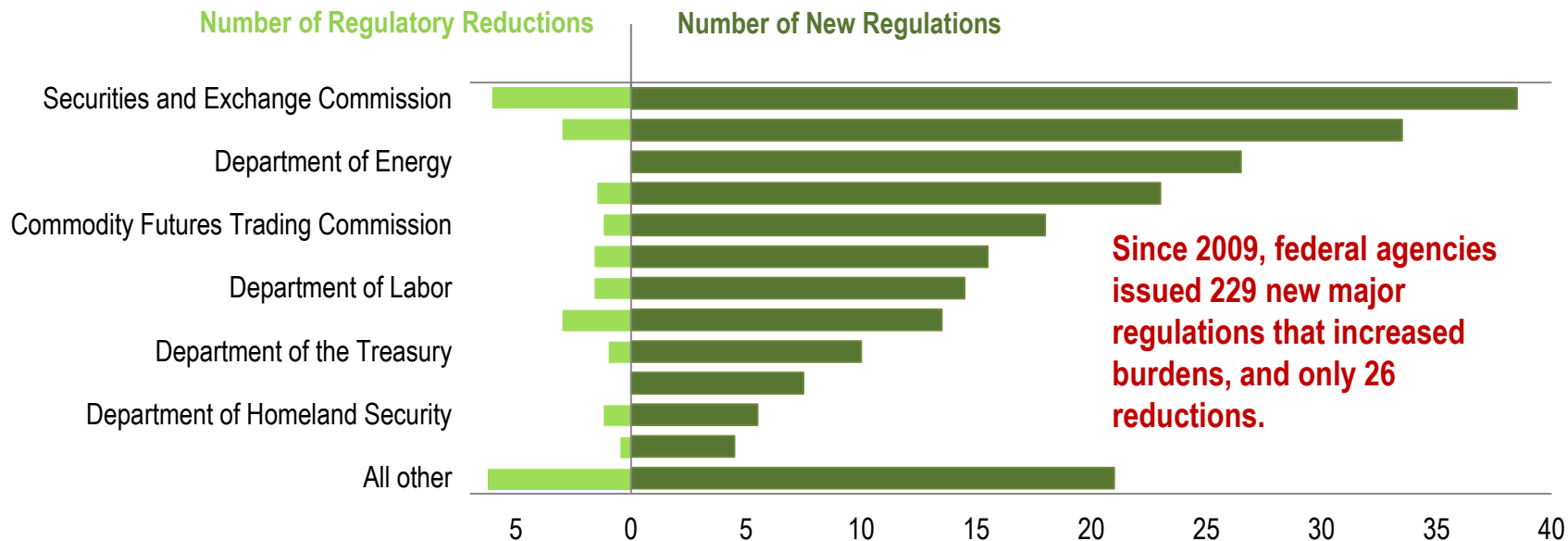


Pharmaceutical Project Pipeline



Global Public Equity Program

Lower regulation is positive for financial stocks



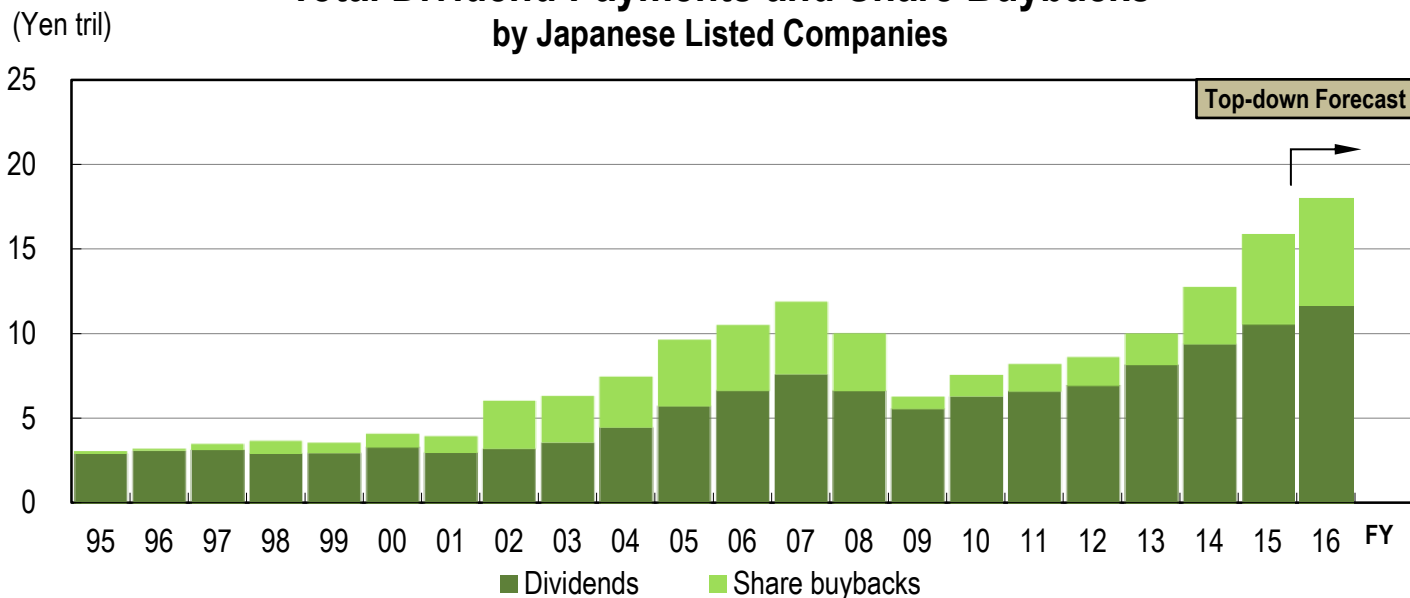
SOURCE: Heritage Foundation calculations based on data provided by individual agencies

Global Public Equity Program

Japanese corporations becoming more shareholder friendly



Total Dividend Payments and Share Buybacks by Japanese Listed Companies



Note: Universe = All listed companies.

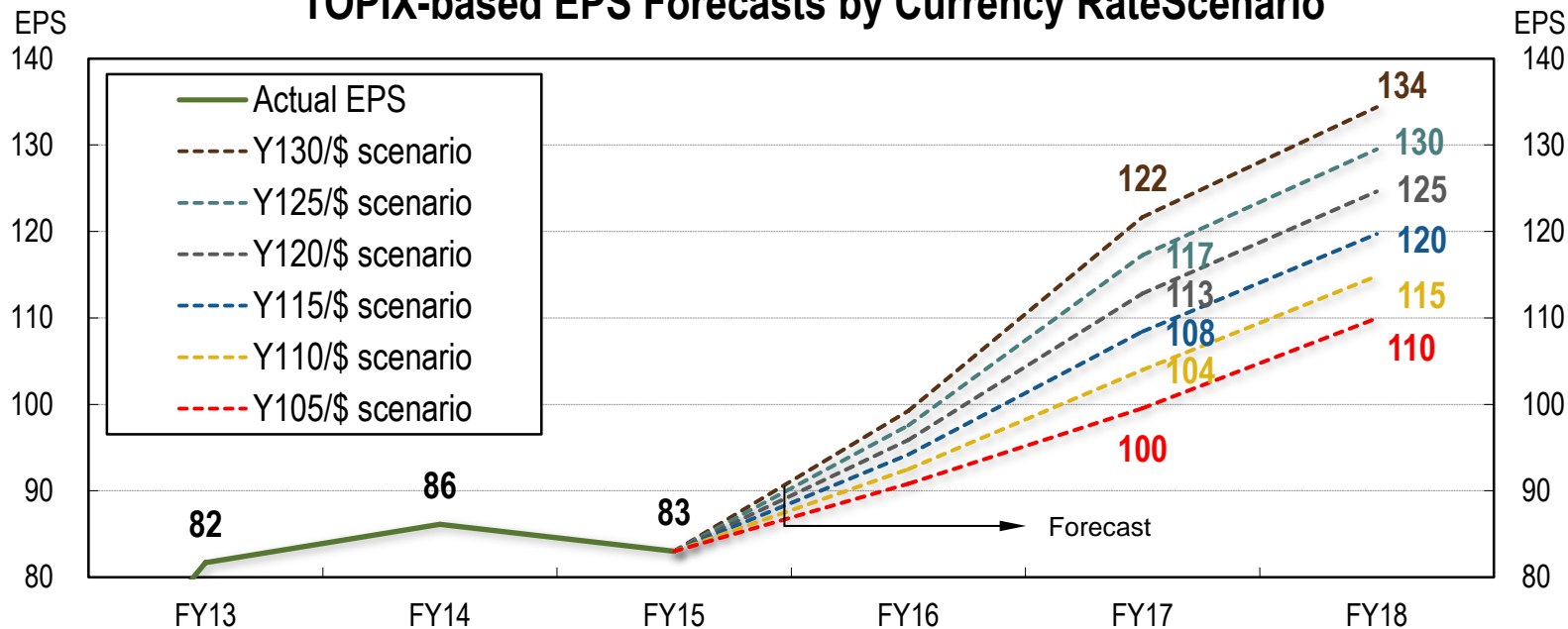
Source: Toyo Keizai; compiled by Daiwa Securities.

Global Public Equity Program

A weaker currency is very beneficial to Japan



TOPIX-based EPS Forecasts by Currency Rate Scenario



Source: Compiled by Daiwa Securities

ERS Global Public Equity

Best Ideas Program

Global Public Equity Program

Best Ideas Program



- Program launched 3-years ago
- Specific Strategies to help us beat the “market” (our global benchmark)
 - Verifiable results - back-testable and/or large body of academic & empirical support
 - Run in-house – creates proprietary strategies at very low cost
 - Low maintenance – does not tax existing resources

Global Public Equity Program

Best Ideas Program



	Portfolio Inception Date	Portfolio AUM 12/31/2016	% of Trust Assets	Calendar Year 2016 Performance
Spinoff	5/1/2014	\$353,221,827	1.4%	18.28
Capitol Hill	9/1/2014	\$230,514,551	0.9%	10.09
Tactical Large Cap Quant	5/1/2016	\$213,185,374	0.8%	11.22 ¹
Global Public Equity Special Situations		\$796,921,752	3.1%	14.71
Global Public Equity Benchmark				8.72
Variance				6.00
% of Public Equities			6.7%	
% Limit of Public Equities			10.0%	

1 - since inception in May 2016

Global Public Equity Program

Best Ideas Program - New Ideas



- One formal pitch in the past year
 - Fortune Magazines Best 100 Companies to work for
- One idea informally discussed
 - Master Limited Partner Fund (MLP)
- Neither Best Companies nor MLP pursued and nothing else currently under discussion or review
- High interest in exploring internationally oriented strategies

Global Public Equity Program

Best Ideas Program - Summary



Successful implementation of the program and three portfolios

- All portfolios POSITIVE contributors to Public Equities versus Global Public Equity Benchmark
- Differentiated strategies
- Minimal strain on existing resources
- Capacity for new Ideas

ERS Global Public Equity

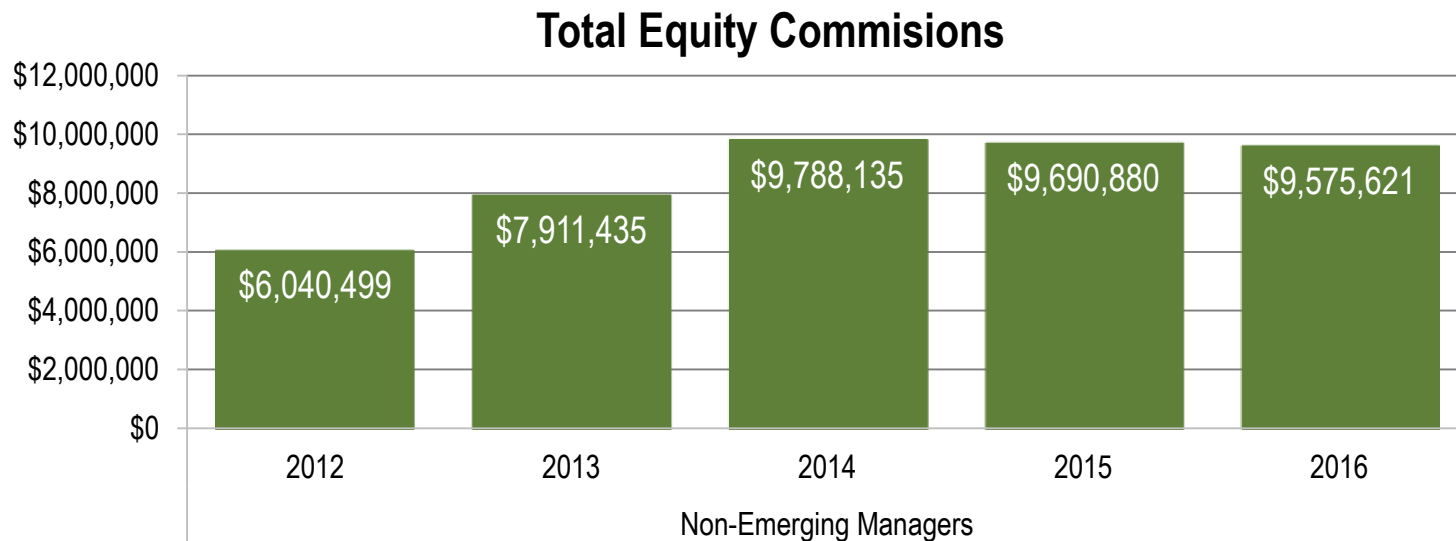
Trading Update

Global Public Equity Program

ERS Total Commissions Paid to Brokers/Dealers



Another very active year of trades



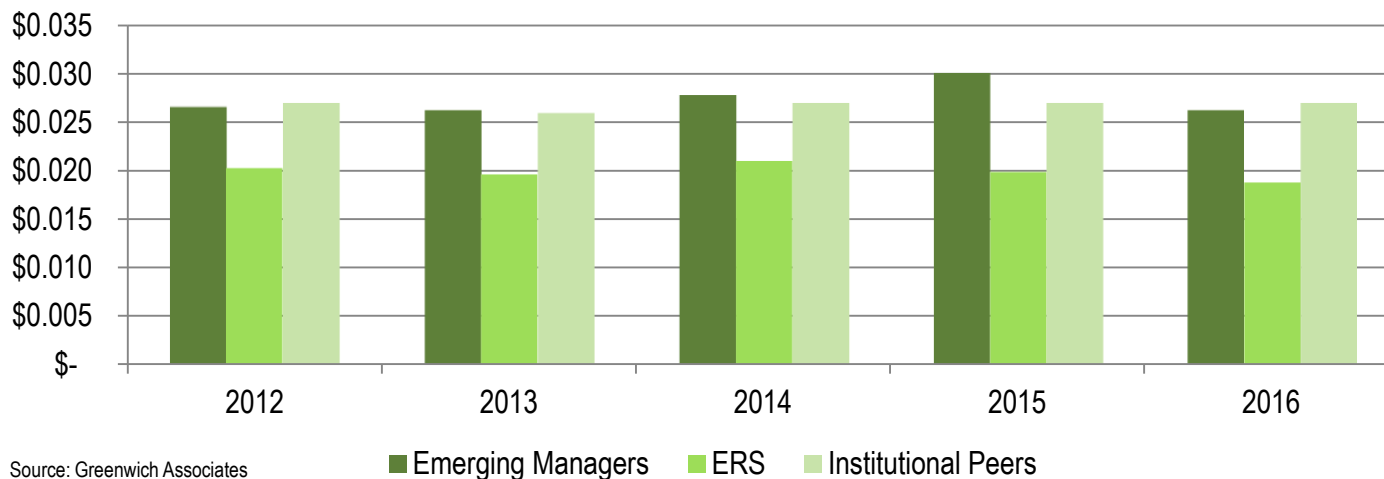
Global Public Equity Program

Commission Rate Per Share Comparison (Domestic)



Commissions continue to be lower than peers and external management

Relative Commission Rates



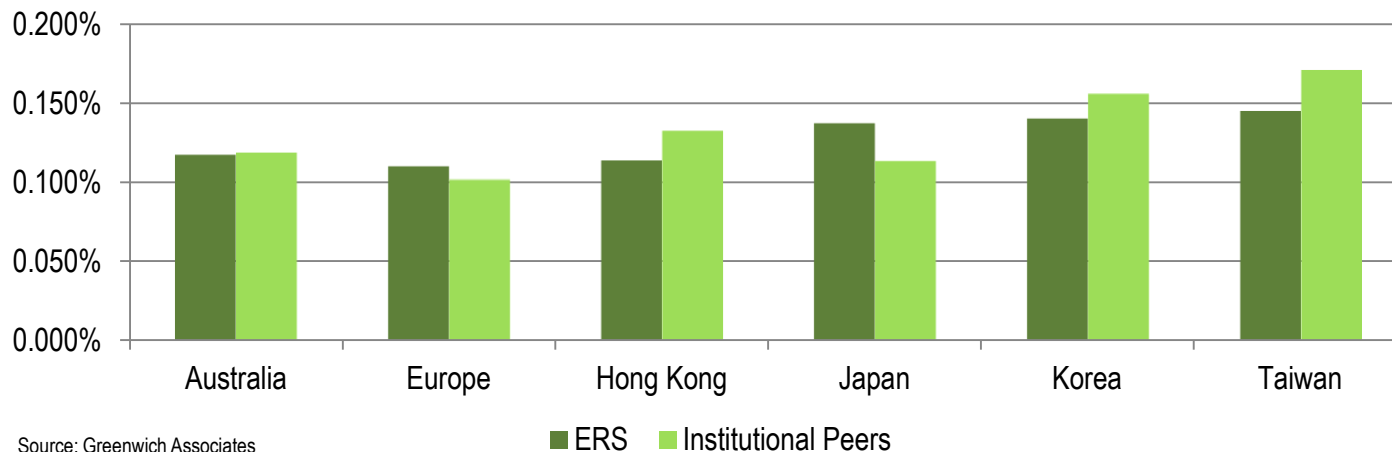
Global Public Equity Program

Commission Rate Comparison in Basis Points (International)



ERS continues to be competitive with international peers

International Commission Rates

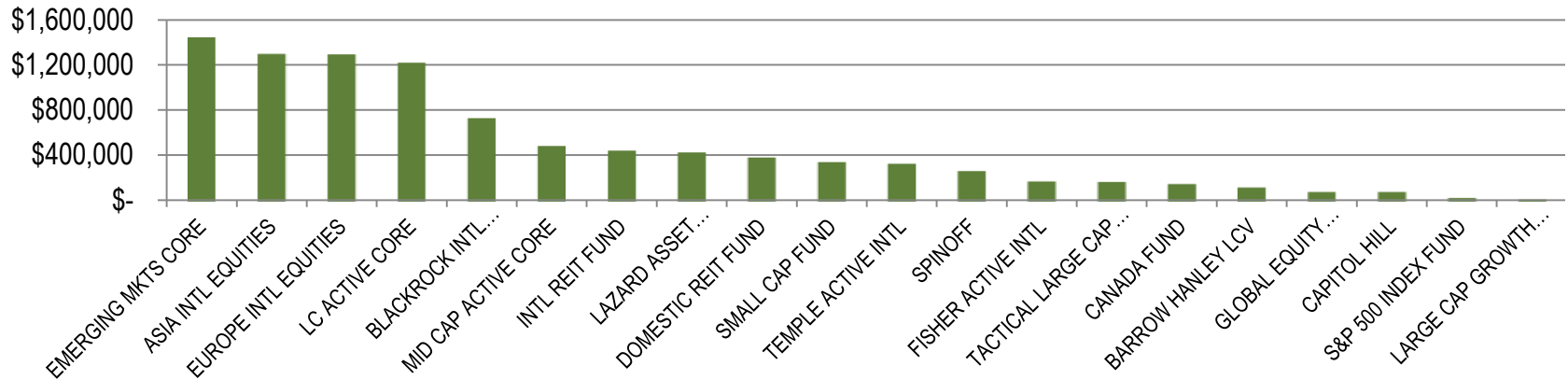


Global Public Equity Program

Commissions by Portfolio Paid to Brokers/Dealers



- Commissions for 2016 totaled \$9.7 million
- Total for Internal Portfolios was \$7.8 million (80%)
- Total for External Portfolios was \$1.8 million (19%)
- Total for Emerging Manager Portfolios was \$113 thousand (1%)



ERS Global Public Equity

Goals and Objectives for 2017

Global Public Equity Program

Goals and Objectives for 2017



- Work with hedge fund team to find additional portfolios that are complementary
- Foster more ideas for our Best Ideas program
- Work with external advisor team to continue the search for direct international small cap managers and explore external needs in other international markets
- Continue to build out the options program
- Continue to integrate and train the team

Questions?

Public Agenda Item #9b

Review and Discussion of Global Public Equity Program:

9b. Review and Discussion of Global Public Equity External Advisor Program

February 22, 2017

Sharmila Kassam, Esq., CPA, Deputy Chief Investment Officer

Lauren Honza, CFA, Portfolio Manager

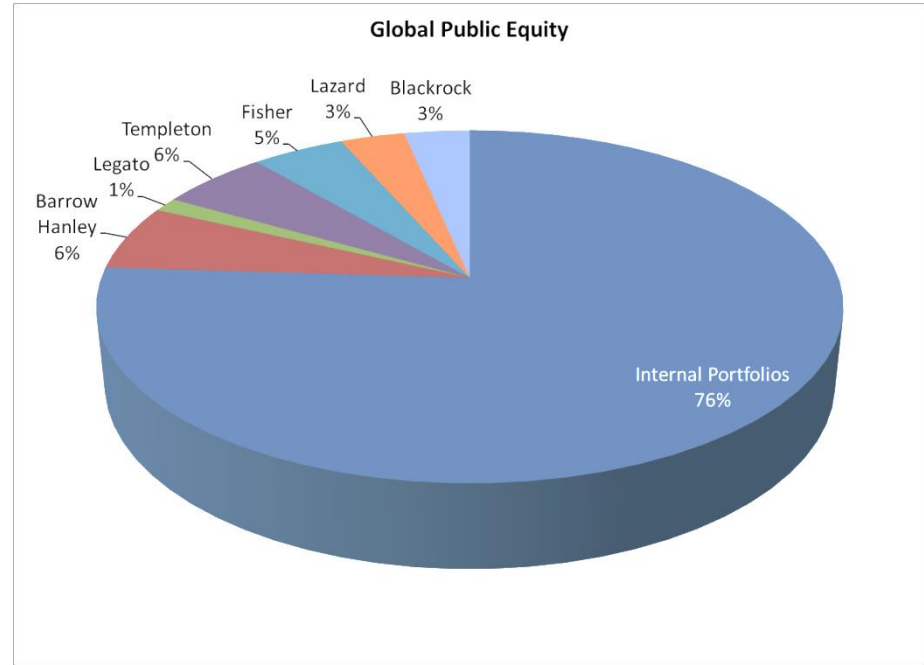
Michael McCrary, Investment Analyst

External Advisor Program

External Advisors Objectives



- Complement internal management
- Expand opportunity set
- Seeking active managers with differentiated and opportunistic strategies
- 76% internally managed; 24% externally advised



External Advisor Program

Global Public Equity External Advisor Team



Sharmila Kassam

Deputy CIO

- BBA, University of Texas
- JD, University of Texas
- CPA
- 13+ Years Investments Experience / Securities Law
- 6+ Years Operational/Management Experience
- 9 Years at ERS

Lauren Honza

Portfolio Manager

- BS, University of Texas
- MBA, University of Texas
- CFA Charterholder
- 23+ Years Investments Experience
- 7 Years at ERS

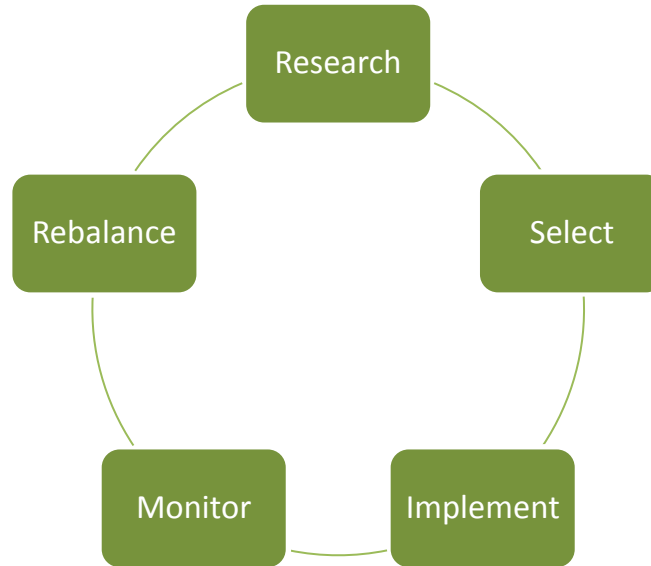
Mike McCrary

Investment Analyst

- BBA, Texas Tech University
- MBA, Southern Methodist University
- 18+ Years Investments Experience
- 3+ Years at ERS

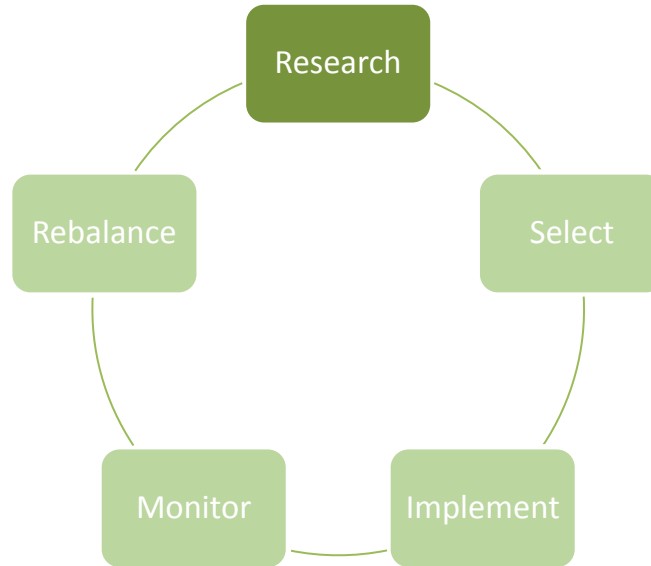
External Advisor Program

Investment Process



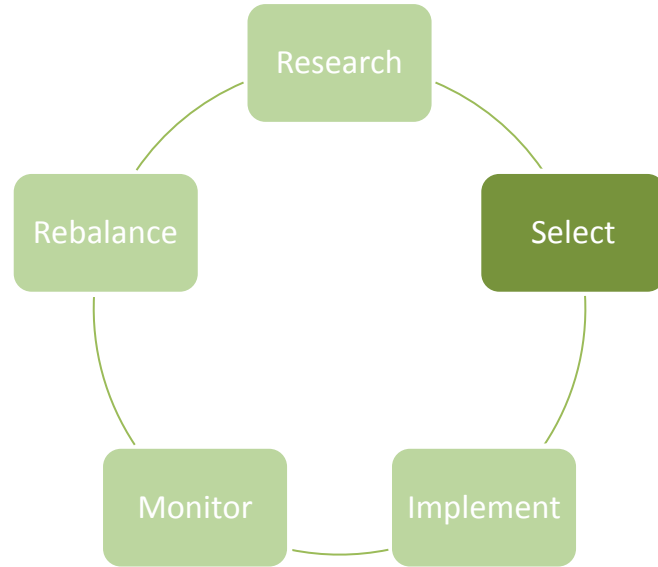
External Advisor Program

Investment Process



External Advisor Program

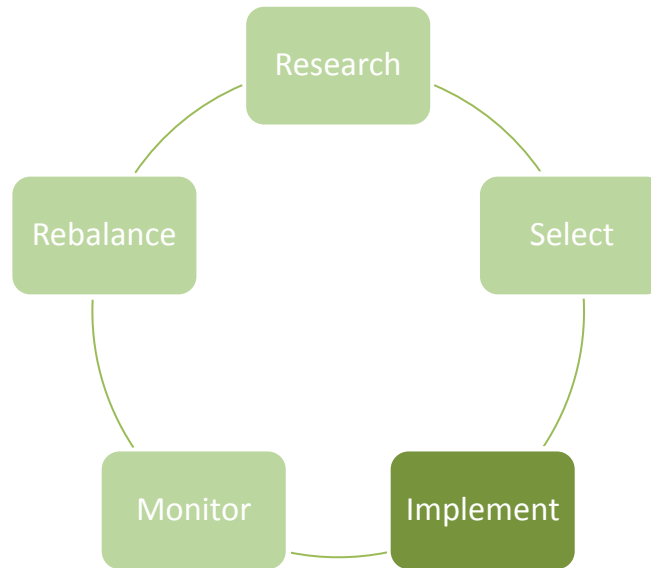
Investment Process



- Conduct appropriate search process
- Approval of firms delegated by Board to Internal Investment Committee (IIC) to be included in the Select Pool

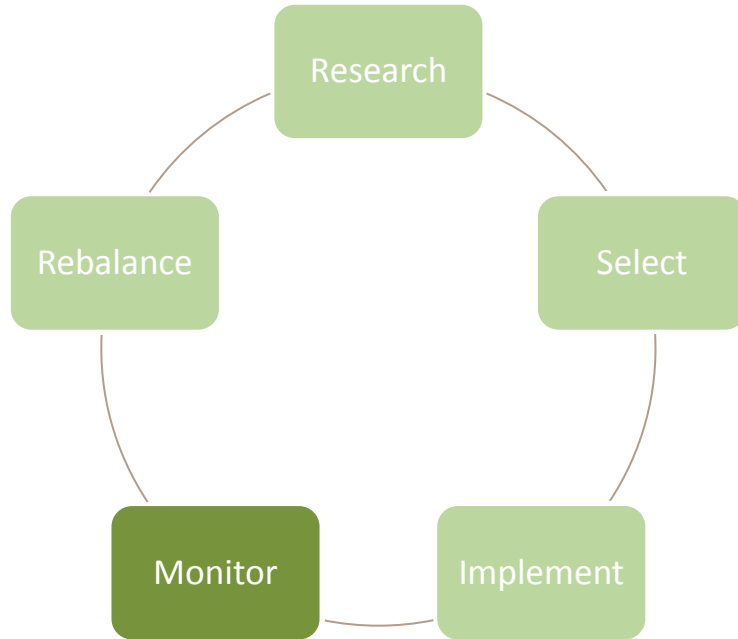
External Advisor Program

Investment Process



External Advisor Program

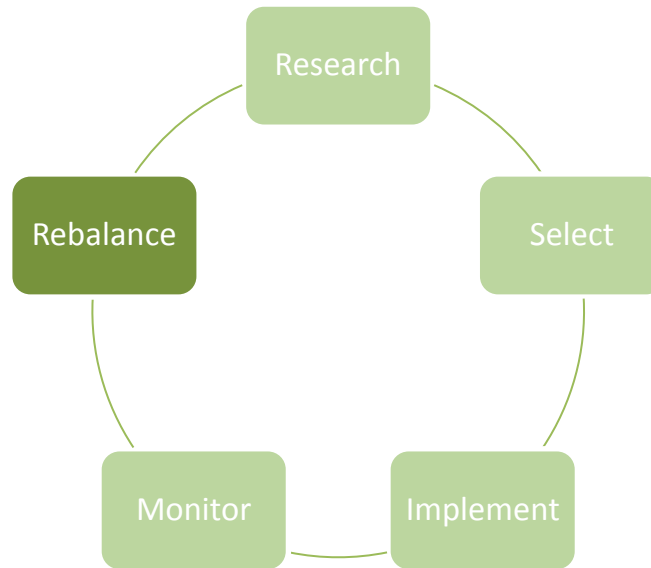
Investment Process - Monitor



Daily	<ul style="list-style-type: none">- Review Trades
Monthly	<ul style="list-style-type: none">- Review Portfolio- Monthly Meetings with Global Public Equity PMs
Quarterly	<ul style="list-style-type: none">- Internally Generated Report- Portfolio Review with Manager (Conference Call)
Semi-Annually	<ul style="list-style-type: none">- <i>Monitoring Form</i>- Portfolio Review with Manager (In-Person Meeting)
Annually	<ul style="list-style-type: none">- Review ADV- Asset Class Peer Review- Operational Due Diligence- Consultant Manager Reports

External Advisor Program

Investment Process



External Advisor Program

Review of 2016



- New Mandates – Legato International Small Cap Emerging Manager Program of \$150 million funded 12/31/16
- Refresh Select Pool (Unfunded Mandates)
- Focus on Best Practices for Manager Selection

External Advisor Program

Legato/International Small Cap Mandate



Firm/People

- The firm was founded in 2004 and is focused on manager of emerging manager mandates
- The Investment Committee consists of Victor Hymes, Adam Lawlor, and Eric Pollack

Philosophy

- They believe the greatest stability of alpha can be achieved by combining high conviction investment managers whose approaches are diversified

Process

- Integrate selection, asset allocation and risk management to deliver customized solutions to every client

Managers

- | | |
|----------------------------|---------------------------------|
| • Algert Global | Global Alpha Capital Management |
| • Ativo Capital Management | Kabouter Management |

External Advisor Program

External Advisors (Funded)



	Strategy	Selection Date	Portfolio Inception	Funded Status as of 12/31/2016	Monitoring Status
Barrow, Hanley, Mewhinney & Strauss	Large Cap Value	12/2/2010	4/1/2011	\$687,210,905	Good
BlackRock	MSCI ACWI ex-US	12/2/2011	3/1/2015	\$385,355,594	Good
Fisher Investments	MSCI ACWI ex-US	1/24/2006	7/1/2006	\$542,987,942	Good
Lazard Asset Management	MSCI EAFE	8/23/2011	12/1/2011	\$377,276,012	Good
Legato Capital Management	MSCI EAFE Small Cap	5/25/2010	1/1/2017	\$150,000,000	Good
Templeton	MSCI ACWI ex-US	11/19/2002	4/1/2003	\$635,820,946	Good

External Advisor Program

Barrow Hanley/Large Cap Value Equity



People

- Mark Giambrone, portfolio manager, supported by a team of over 10 analysts

Philosophy

- To construct portfolios of individual stocks with value characteristics below the market and dividend yields above the market

Process

- Fundamental, Bottom-up Stock Selection
- Initial Universe – Investment Process – Portfolio Construction – Final Portfolio

Performance (net of fees)

- Underperformed S&P 500 Value by 339 basis points in CY2016
- Has outperformed the index by 5 basis points annualized since inception

External Advisor Program

BlackRock/International Equity Focus



People

- James Bristow and Gareth Williams, co-portfolio managers, are supported by Teun Draaisma, Macro Strategist, and a Global Equity Team (13 investment professionals)

Philosophy

- To utilize a flexible, focused, best ideas approach with emphasis on risk management

Process

- Bottom-up Stock Selection with Fundamental Macro Insights
- Idea Generation – Research – Portfolio Construction

Performance

- Underperformed MSCI ACWI ex-US by 368 basis points in CY2016
- Has outperformed the index by 162 basis points annualized since inception

External Advisor Program

Fisher/All Foreign Equity



People

- Investment Policy Committee is the decision making group

Philosophy

- To seek dominant drivers of stock returns: country, sector and macro themes

Process

- Top-down Investment Process
- Portfolio Drivers – Thematic Weights – Prospect List – Stock Selection

Performance (net of fees)

- Underperformed MSCI ACWI ex-US by 202 basis points in CY2016
- Has outperformed the index by 165 basis points annualized since inception

External Advisor Program

Lazard/International Strategic Equity



People

- Mark Little and Robin Jones, portfolio managers, supported by over 70 analysts

Philosophy

- To invest in companies with strong and/or improving financial productivity at attractive valuations

Process

- Fundamental, Bottom-up Stock Selection
- Idea Sourcing – Fundamental Research – Portfolio Construction

Performance (net of fees)

- Underperformed MSCI EAFE by 576 basis points in CY2016
- Has outperformed the index by 172 basis points annualized since inception

External Advisor Program

Templeton/Non-US Equity



People

- Cindy Sweeting, Director of Portfolio Management, supported by a team of 38 people

Philosophy

- To find securities that trade at a discount and take a long-term view

Process

- Fundamental, Bottom-up Stock Selection
- Five-stage process begins with analysts following global industry sectors

Performance (net of fees)

- Underperformed MSCI ACWI ex-US by 240 basis points in CY2016
- Has outperformed the index by 122 basis points annualized since inception

External Advisor Program

Select Pool (Unfunded)



	Strategy	Selection Date	Portfolio Inception	Funded Status as of 12/31/2016	Monitoring Status
Acadian Asset Management	MSCI ACWI ex-US	12/2/2011	n/a	Unfunded	Good
Acadian Asset Management	MSCI Emerging Markets	12/2/2011	n/a	Unfunded	Good; Strategy Closed
AQR Capital Management	MSCI ACWI ex-US	12/2/2011	n/a	Unfunded	Good
Brandywine GIM	Large Cap Value	12/2/2010	n/a	Unfunded	Good
Parametric (Eaton Vance)	MSCI Emerging Markets	12/2/2011	n/a	Unfunded	Good

External Advisor Program

Goals for 2017



- Add to Select Pool with new searches for areas of most interest for active management
- Focus on seeking competitive fees
- Continued review of best practices for manager selection, new investment mandates, and governance

Questions?

Public Agenda Item #9c

Review and Discussion of Global Public Equity Program:

9c. Proposed Revisions to the ERS Investment Policy Addendum XI – Global Public Equity Policies and Procedures and External Advisor Program Tactical Plan

February 22, 2017

Sharmila Kassam, Esq., CPA, Deputy Chief Investment Officer

Lauren Honza, CFA, Portfolio Manager

Michael McCrary, Investment Analyst

ERS Investment Policy

Background



- ✓ In accordance with Section 2.3 of the ERS *Investment Policy*, staff will recommend changes as needed to the Investment Advisory Committee (IAC) and Board.
- ✓ As, the External Advisor Program has expanded the proposed revision further clarifies the selection process and adds more details about the process to the Global Public Equity Policies and Procedures.

External Advisors Program

Proposed Tactical Plan



Addition of Appendix A to Addendum XI, Global Public Equity Policies and Procedures

Global Public Equity External Advisor Program Overview (AS OF 12/31/2016)

- **Refresh Current Select Pool with Additional Searches in Calendar Year 2017**

	Strategy	Selection Date	Portfolio Inception	Funded Status as of 12/31/2016	Monitoring Status
Acadian Asset Management	MSCI ACWI ex-US	12/2/2011	n/a	Unfunded	Good
Acadian Asset Management	MSCI Emerging Markets	12/2/2011	n/a	Unfunded	Good; Strategy Closed
AQR Capital Management	MSCI ACWI ex-US	12/2/2011	n/a	Unfunded	Good
Brandywine GIM	Large Cap Value	12/2/2010	n/a	Unfunded	Good
Parametric (Eaton Vance)	MSCI Emerging Markets	12/2/2011	n/a	Unfunded	Good

- **Additional Searches in Calendar Year 2017 to include:**
 - International Small Cap
 - Emerging Markets
 - Other Focused International Strategies

Questions?

Public Agenda Item #10

Annual Review and Discussion of Proxy Voting and Corporate Governance

February 22, 2017

John Streun, MS, CFA, CPA, Director of Global Public Equity

Flavia de la Fuente, MBA, Global Public Equity Analyst

Fassil Michael, Head of Custom Research at ISS

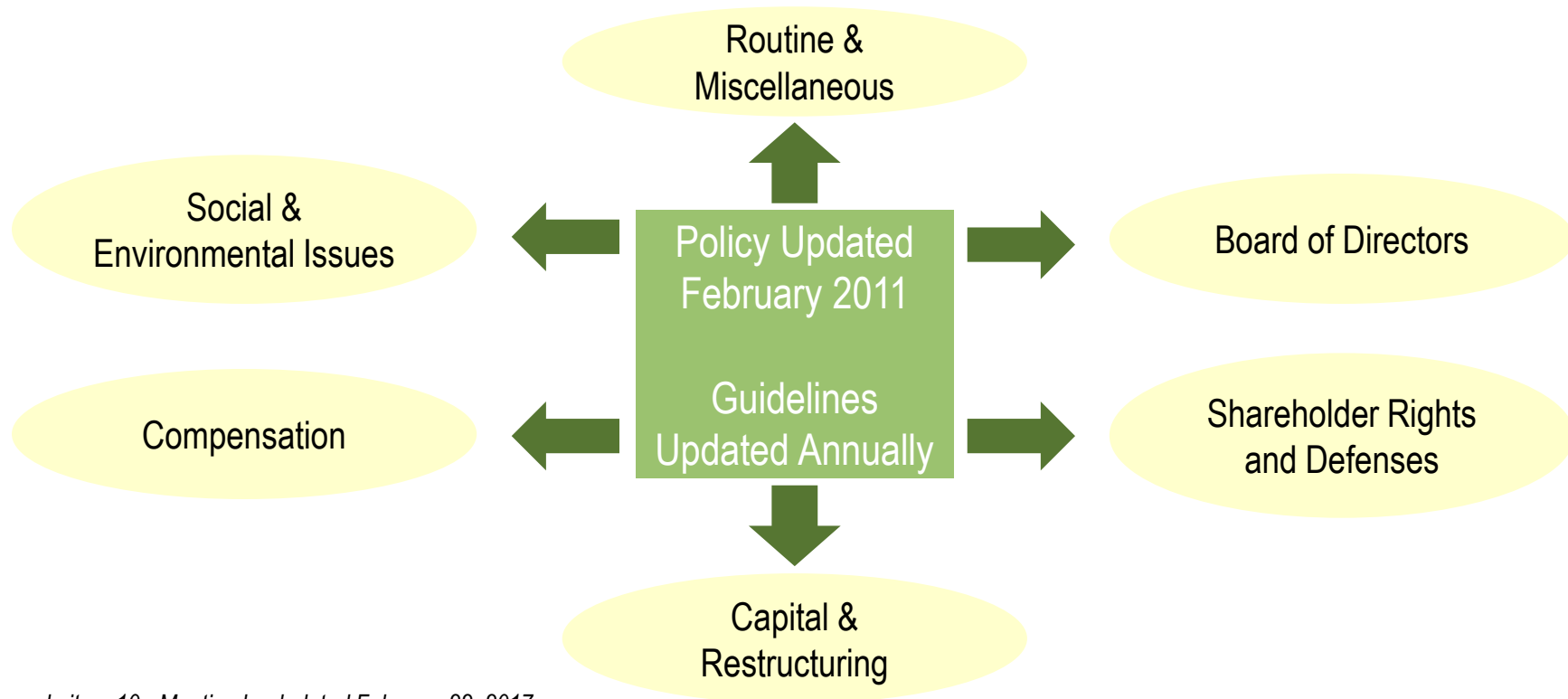
ERS Proxy Voting

Background



- The ERS Board of Trustees recognizes that the right to vote proxies:
 - Has economic value
 - Includes the management of voting rights as fiduciaries
 - Must be exercised for the sole economic benefit of ERS

ERS Proxy Voting Guidelines



ERS Proxy Voting

Process



- Proxies are voted through Institutional Shareholder Services' (ISS) electronic proxy voting system
 - Rules based on guidelines
 - Most votes are automatic based on rules
 - Case-by-case referred back to ERS Analyst/Portfolio Manager
- During 2016, 0.6% of all proposals were referred to ERS Staff

ERS Proxy Voting

2016 Activity



ERS Proxy Voting Results 01/01/16 – 12/31/16

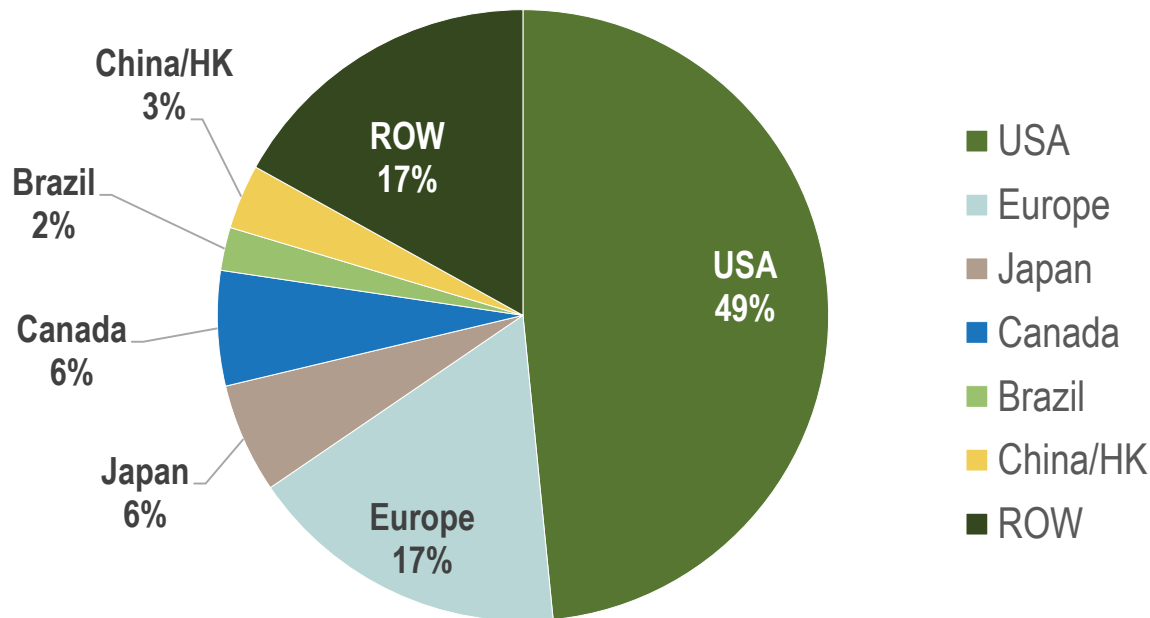
Agenda Item Category	Total Voteable Proposals 2016	% of Time Voted With Management 2016	% of Time Voted With Management 2015
Routine/Miscellaneous	3,566	96%	95%
Board of Directors	12,689	95%	94%
Shareholder Rights and Defenses	192	90%	88%
Capitalization	1,035	87%	71%
Reorganizations, M&A	300	94%	93%
Compensation	2,180	87%	86%
Social/Environmental Issues	275	73%	67%
Other Shareholder Proposals	479	57%	48%
Preferred/Bondholder	13	100%	100%
Total	20,729	93%	90%

ERS Proxy Voting

2016 Activity - Voteable Meetings by Region



Globally, ERS voted over 20,000 proposals in over 40 markets

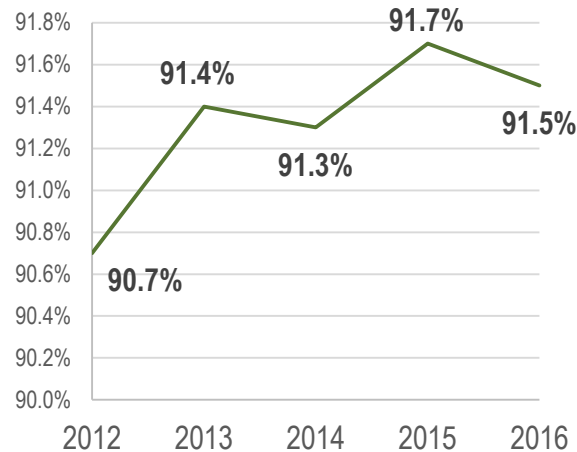


ERS Proxy Voting

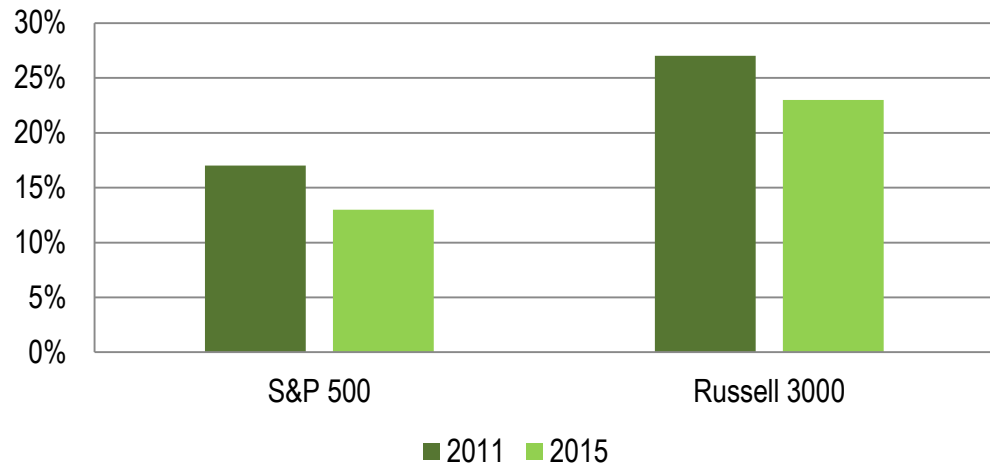
2016 Review - Compensation



% Shares Cast In Support of MSOP



Percentage of Companies Paying Discretionary Bonuses



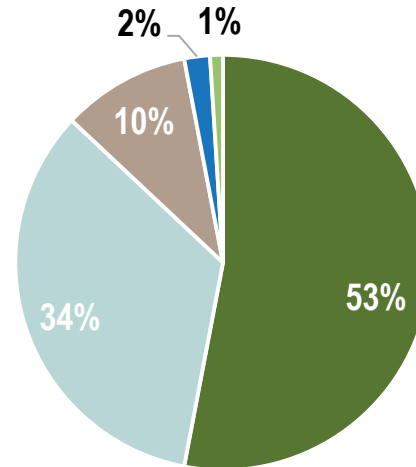
ERS Proxy Voting

2016 Review - Environmental and Social Governance



- Focus on climate risk in portfolios
- All time high of 91 climate risk proposals filed (previously 68)
- Number of proposals going to a vote at all time high
- Board diversity, non-discrimination, gender pay gap proposals received majority support

Status of Environmental and Social Resolutions



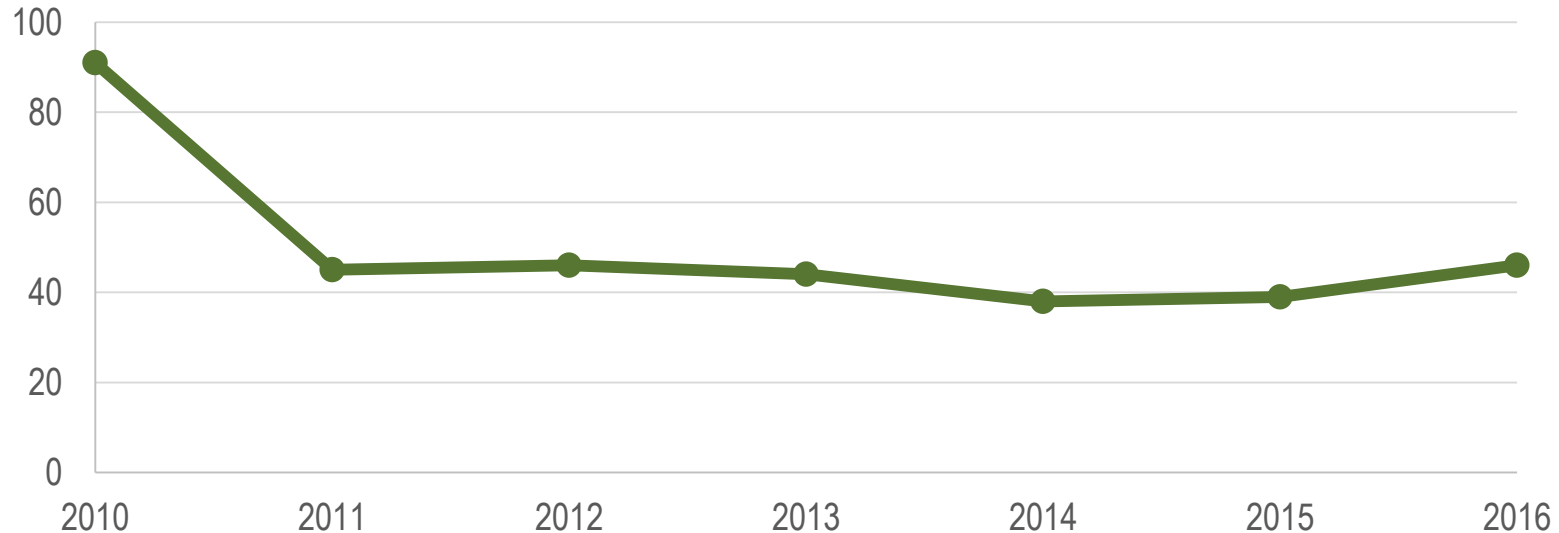
■ Voted ■ Withdrawn ■ Omitted ■ Pending ■ Other

ERS Proxy Voting

2016 Review - Majority Withhold/Against Votes



Number of Majority Withhold/Against Votes in Russell 3000

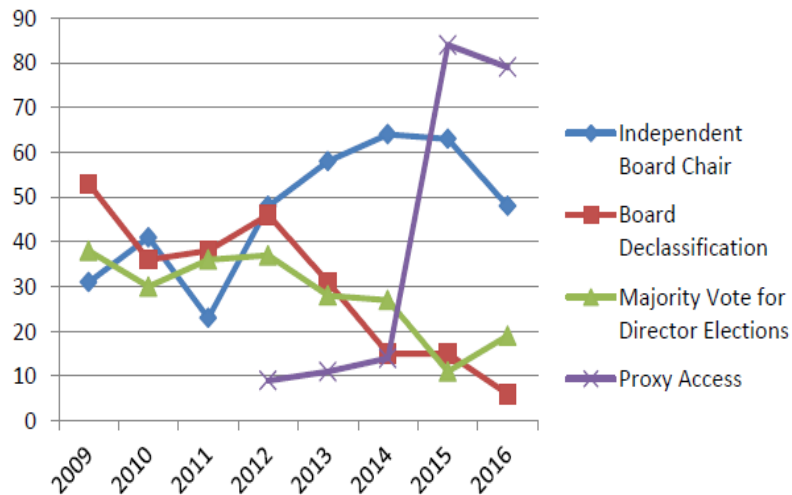


ERS Proxy Voting

Corporate Governance - Related Shareholder Resolutions

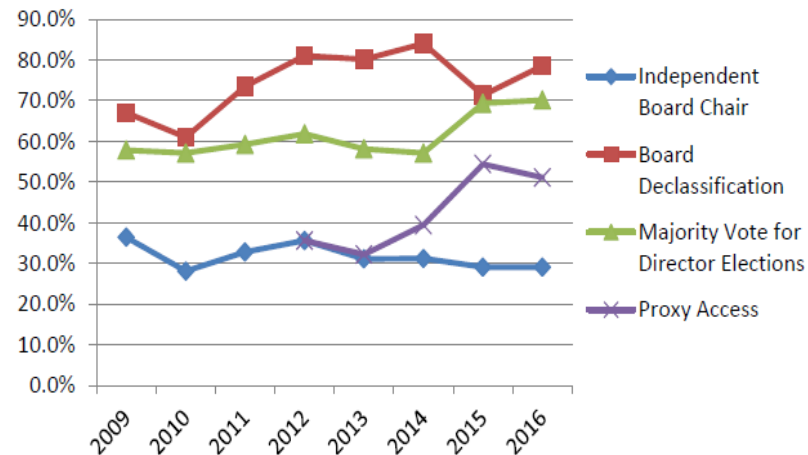


Prevalence of Board Related Shareholder Proposals



*Source: ISS Voting Analytics

Trends in Average Shareholder Support for Board Related Shareholder Proposals



*Source: ISS Voting Analytics



GOVERNANCE

EMPLOYEES RETIREMENT SYSTEM OF TEXAS

› Board Meeting, February 22, 2017

ISS: THE GLOBAL LEADER IN GOVERNANCE

Now more than ever, Governance Matters

www.issgovernance.com

Looking Ahead

Key Topics for 2017 Proxy Season

- ✓ Proxy Access
- ✓ Board Refreshment
- ✓ Say on Pay
- ✓ E&S Campaigns
- ✓ Other Governance Topics to Watch



- ✓ › **More Than 360 Access Rule Adoptions**
 - › **52.4 percent of S&P 500 firms have access provisions in place**
Up from less than 1 percent in 2014
 - › **Small cap gap grows**
4.1 percent of Russell 3K (ex-S&P 500) firms
 - › **Most bylaws mimic the SEC's 3 percent-for-3 years formulation**
 - › **Nearly all companies set board seat limits for access candidates**
20 and 25 percent (SEC's favored limit) of seats are most common
Newer formula-driven versions seek to guarantee at least two seats via access
 - › **Most boards set shareholder aggregation limits or ranges**
20 shareholders limit is most popular; a handful restrict to one holder
- ✓ › **2017 Campaign Will Split Between Adopt and Line Item Veto Proposals**
 - › **NYC funds continue to drive access proposals; most will be withdrawn**
 - › **Individual investors push "fix it" proposals; some excluded via no-action process**

Boards Have **Limited Tools** to Drive Refreshment



RETIREMENT
POLICIES



TERM
LIMITS



BOARD/
DIRECTOR
EVALUATIONS

- ✓ Term limits are effective in managing board tenure.
- ✓ Term limits promote turnover.

Term Limits Remain Rare.

Retirement Ages
Move Toward

75

YEARS OLD



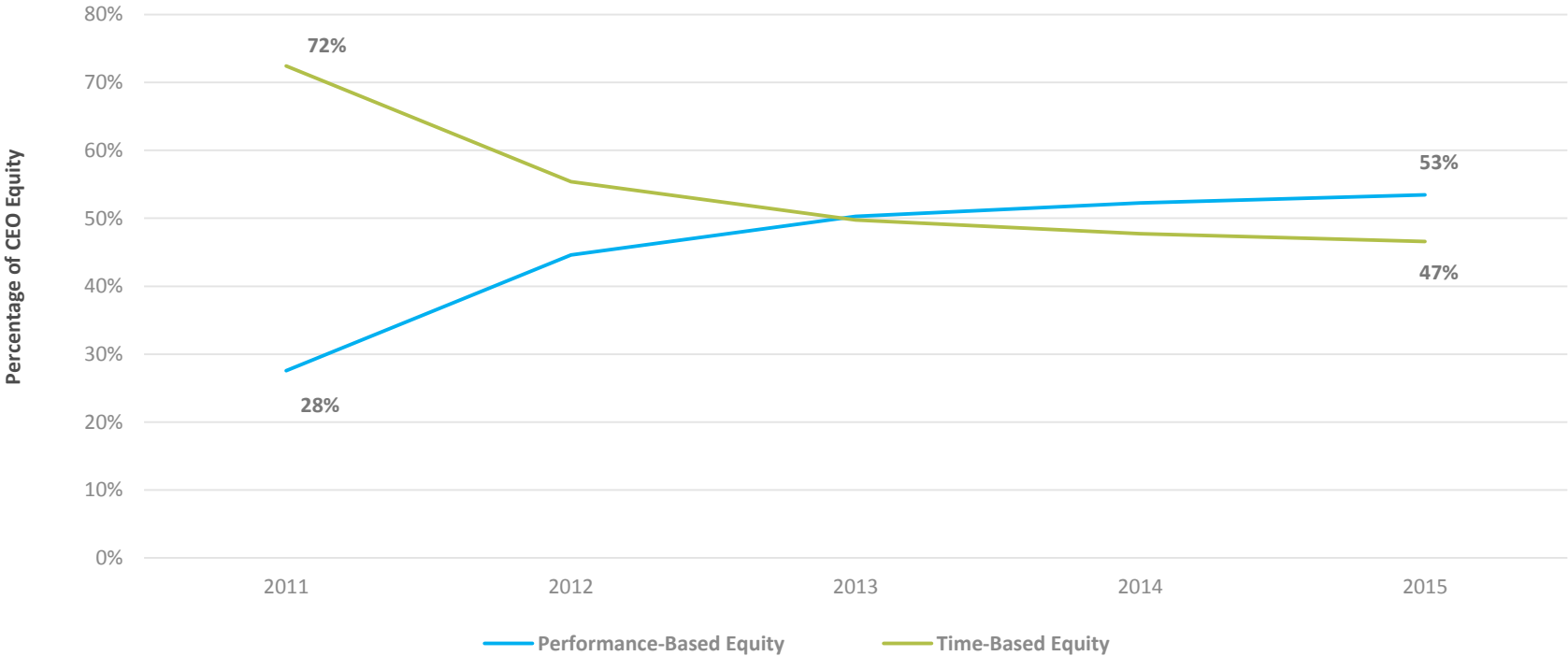
4 of every 10
Boards Feature Mandatory
Retirement Ages

Board Evaluations Are Close to Universal Practice

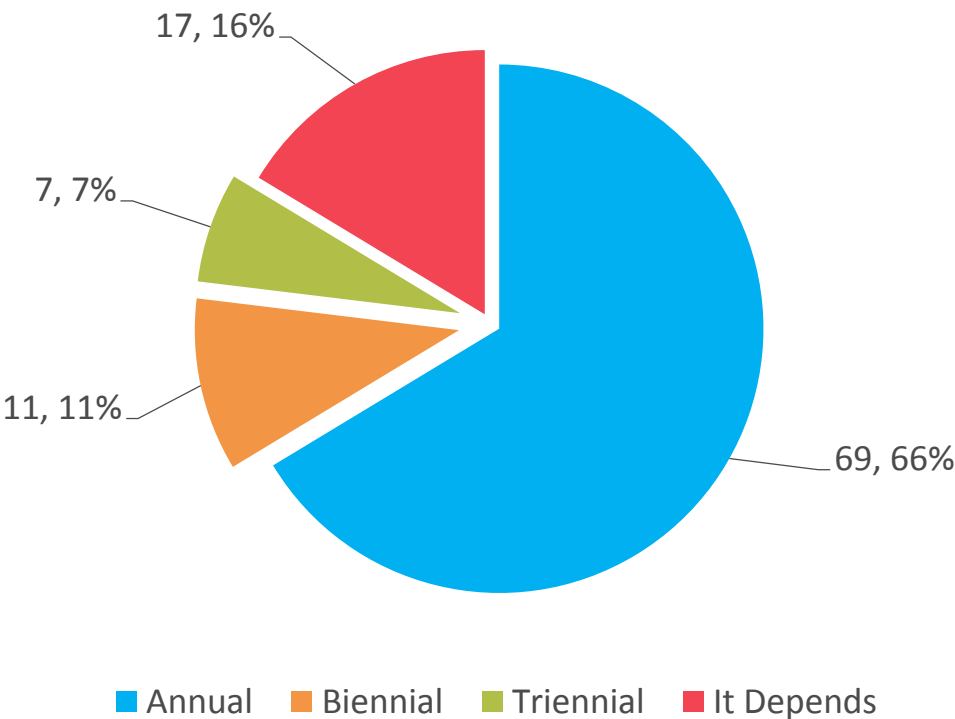


Effectiveness is difficult to assess.
Very few boards disclose details about the
outcomes of their assessments.

CEO Performance-Vested vs. Time-Vested Equity (S&P 500)

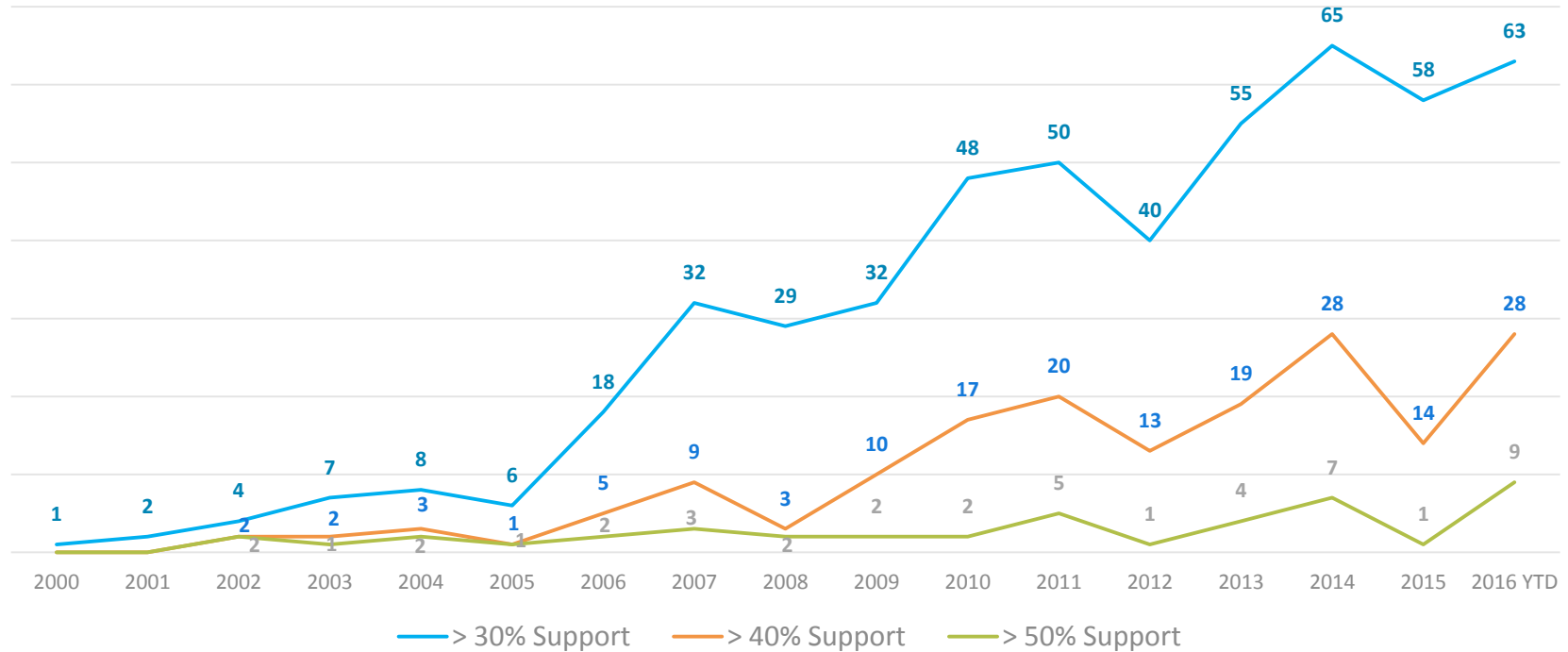


2017 Survey: Say-on-Pay Frequency Should Be...?



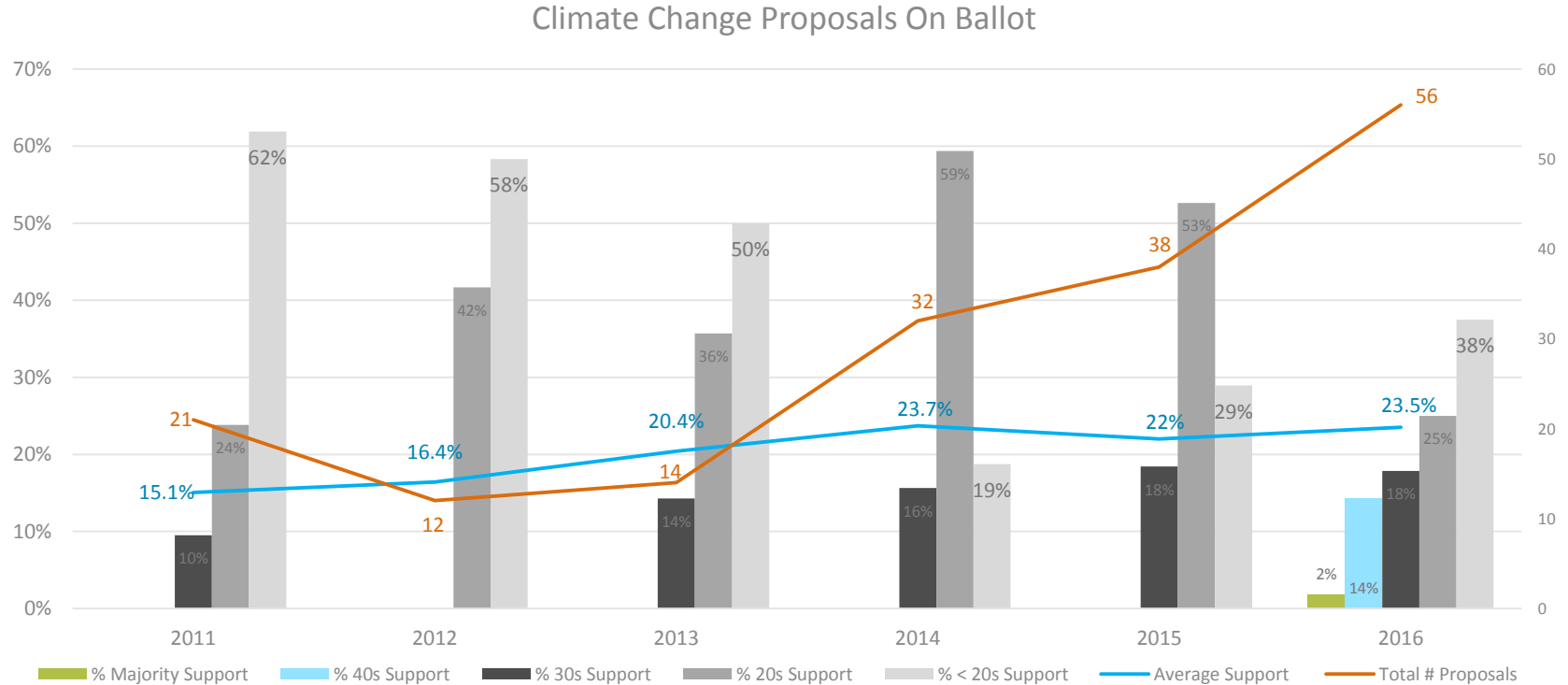
Rising Levels of Support for E&S Issues

of E&S Proposals Receiving Significant Support



Data as of October 15 Source: ISS Voting Analytics

2016 “Hottest” Year Yet for Climate Change Proposals



Hot Topics for Governance Shareholder Proposal and Engagement Campaigns

- › Independent Chair—Look for more specific targeting: Chipotle
- › Majority Voting (MTV)—Activism moves downstream to middle market and small caps
 - › Small-cap MTV gap: S&P 500, 84.9 percent vs. Russell 3K (ex-S&P 500), 27.3 percent
 - › Binding proposals expected in wake of responsiveness concerns; “consequential” MTV
- › Supermajority/Simple Majority Vote—Focus on bylaws amendments
- › One Share, One Vote—Growing momentum for proposals in response to recent IPOs (Next up: Snap)
- › Vote Counting—Calls to limit abstentions
- › Confidential Voting/Access to Ballot Tallies—Out at SEC
- › Online Only AGMs—Out at SEC

Questions?

Public Agenda Item #11a

Review, Discussion and Consideration of the Private Infrastructure Program:

11a. Private Infrastructure Market Update and Program Overview

February 22, 2017

Pablo de la Sierra Perez, Director of Infrastructure and Natural Resources

Jay Yoder, CFA, Managing Director, Pavilion Alternatives Group

Philip Cote, CFA, Associate Director, Pavilion Alternatives Group

Private Infrastructure Program Overview

Agenda - Key Topics



- Team Update
- Portfolio Update as of December 31, 2016
- Market Update
- Goals and Objectives for FY2017 – FY2018
- Long Term Goals and Objectives

Private Infrastructure Program Overview

Team Update



Pablo De La Sierra Pérez

Director of Infrastructure and Natural Resources

- Infrastructure specialist
- Joined ERS August 2014
- Background in direct investing and engineering
- MS Ind. Engineering from Universidad De Oviedo

Ryan Wilkinson

Infrastructure specialist

- Cintra USA
- 6 years experience
- Infrastructure investment analysis
- BS Economics, MS Finance
- Real Assets focused

Private Infrastructure Program Overview

Portfolio Update as of December 31, 2016



- Inception through December 31, 2016: 6 Funds, 9 co-investments, \$751 million committed
 - \$50-\$150 million additional investments expected in FY2017
 - Net Asset Value (“NAV”) of \$440.8 million or 1.67% of system assets
 - 1.01x TVPI¹, 0.08x DPI¹, 0.33 % IRR
- FY2017: Expect 1-3 new commitments
- FY2018: Expect 4-5 new commitments

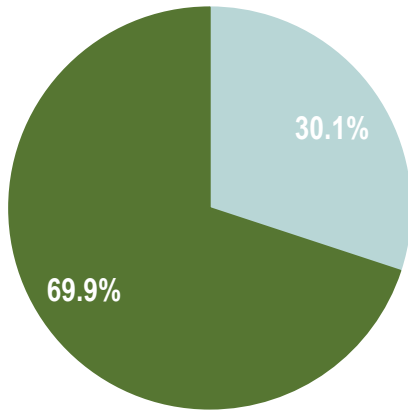
1. TVPI, or Total Value to Paid in Capital, is equal to (NAV + Distributions) / Paid in Capital;
DPI, or Distributed to Paid in Capital, is equal to Distributions / Paid in Capital

Private Infrastructure Program Overview

Portfolio Update as of December 31, 2016

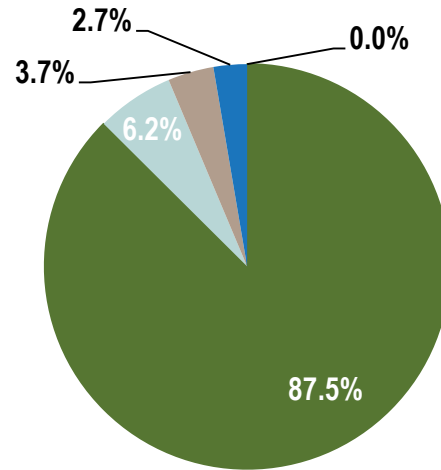


Geography¹



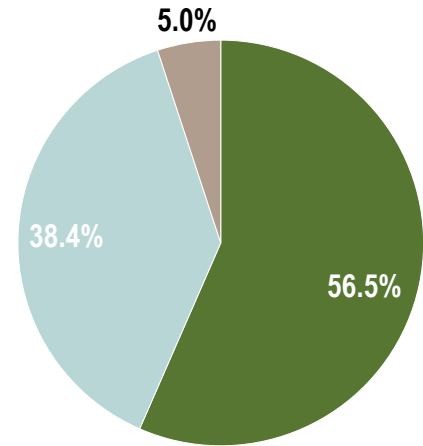
Emerging Markets Developed Economies

Sector¹



Energy, Power and Utilities Telecom
Transportation Shipping
Social

Strategy¹



Opportunistic Value-add Core

1 – Based on NAV

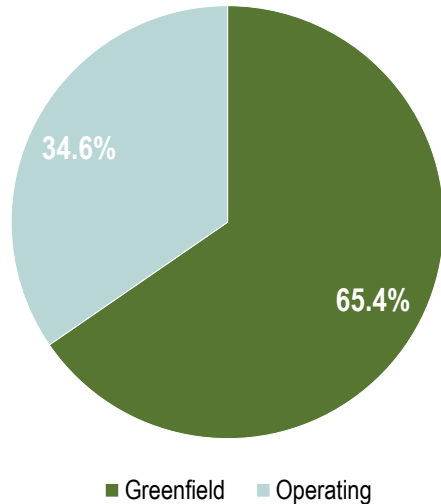
2 – Based on Committed Capital

Private Infrastructure Program Overview

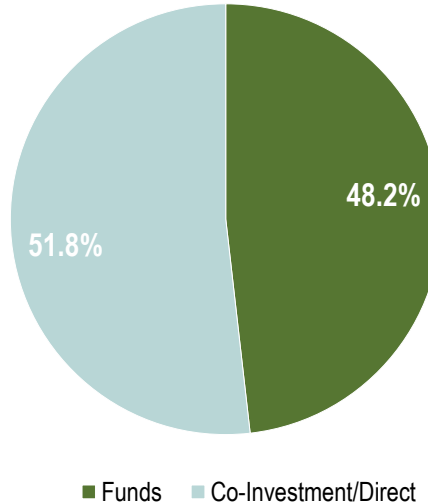
Portfolio Update as of December 31, 2016



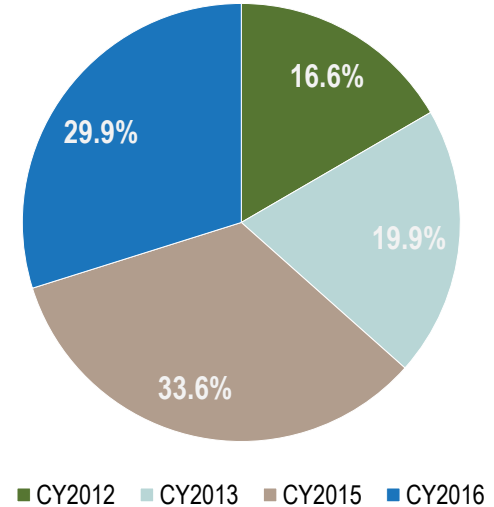
New Construction vs Operating¹



Vehicle²



Vintage²



1 – Based on NAV

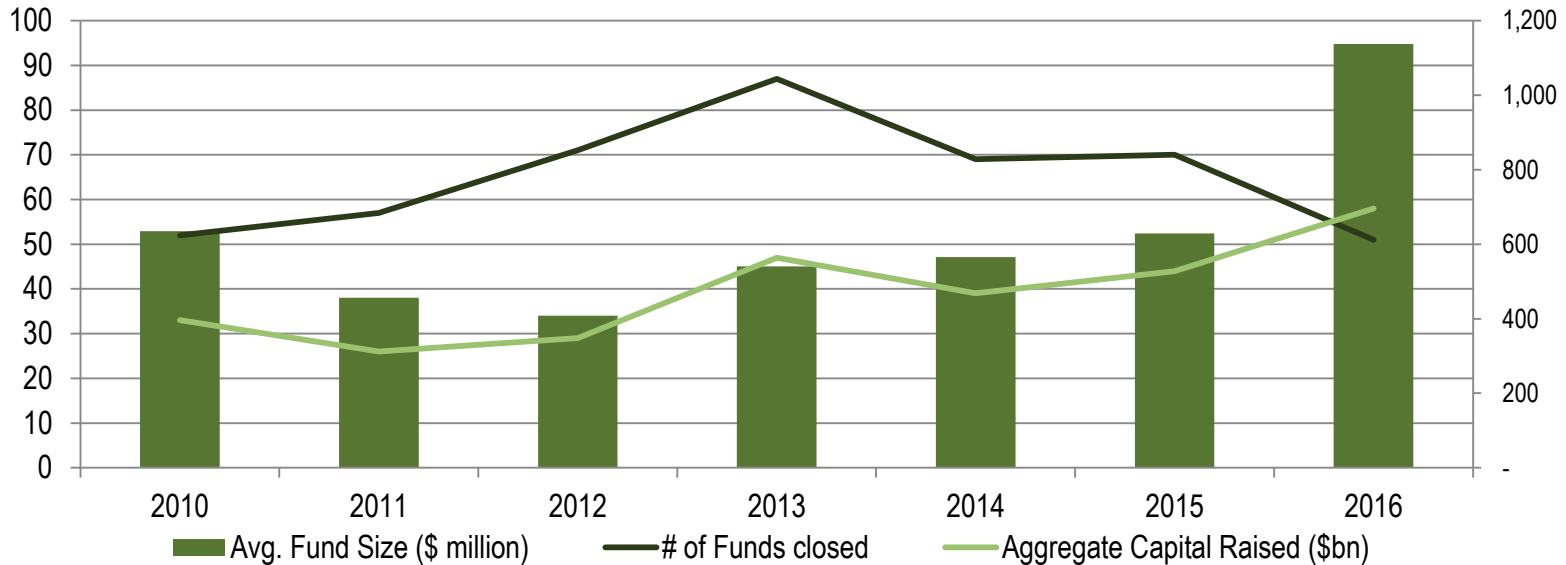
2 – Based on Committed Capital

Private Infrastructure Program Overview

Market Update



Fundraising level has continued to be strong



Source: Preqin Infrastructure Online

Private Infrastructure Program Overview

Market Update



- Energy, Power and Utilities remain largest subsectors
- Expanding private infrastructure universe:
 - Debt
 - Renewable energy
 - Midstream
 - Telecommunication
 - Other
- New Construction (Greenfield)
- Direct investments / co-investments

Private Infrastructure Program Overview

Market Update - Outlook



- Strong need for global infrastructure investment
- Developing asset class
 - Standardization and market information
- Increased fundraising activity
- Evolution of traditional Private Equity-style fund-investment model
- Political environment - opportunities

Private Infrastructure Program Overview

Goals and Objectives for FY2017



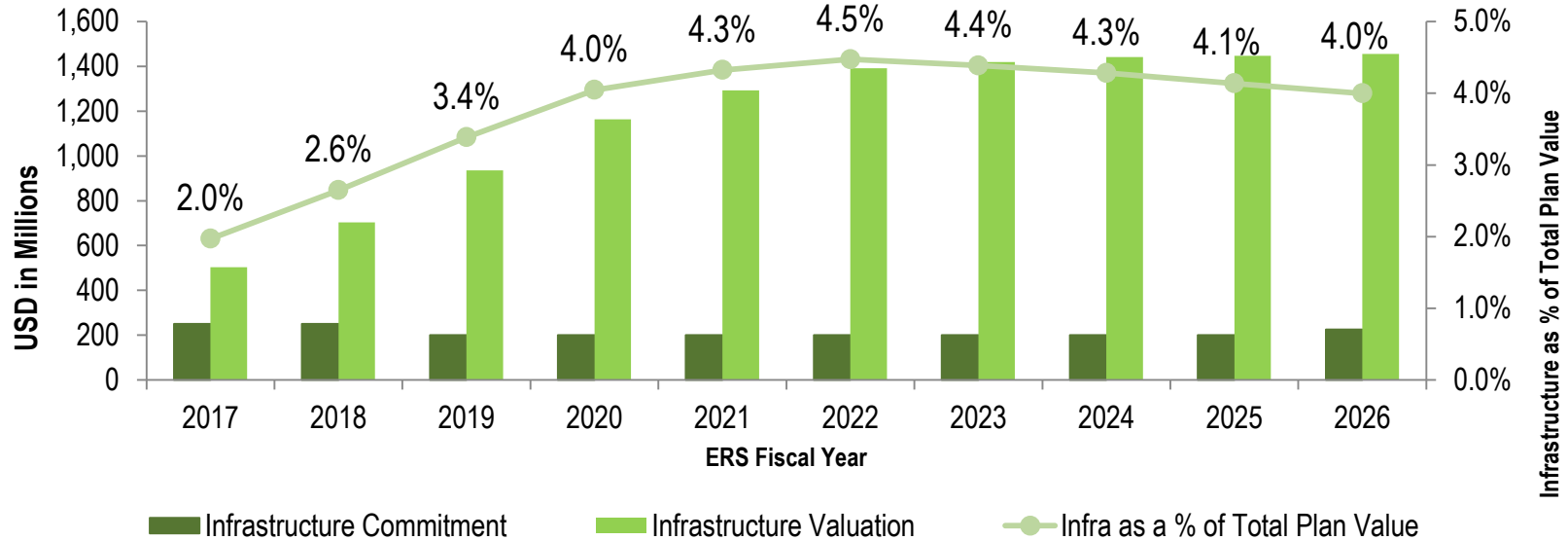
- Continue pursuing direct investments and co-investments
- Seek to diversify portfolio
- Seek to pool and manage capital with other investors
- Seek to enhance operational flexibility
- Execute Tactical Plan

Private Infrastructure Program Overview

Long Term Goals and Objectives



Reaching allocation in 2020



Private Infrastructure Program Overview

Infrastructure Consultant Performance



- Frequent calls with staff/in-person meetings
- Annual on-site visit at consultant office in May 2016
- Regular reporting
- Investment Recommendation

- Staff reviewed Policies and Procedures with consultant
 - No proposed changes

Questions?

Private Infrastructure Portfolio Update



Employees Retirement System of Texas

February 2017

Pavilion Alternatives Group™

Presenting Today

- Jay A. Yoder, CFA
 - *Managing Director*
- Phil Cote, CFA
 - *Associate Director*

Discussion Overview

- I. Update on ERS Private Infrastructure Portfolio
- II. Looking Back: Market Facts and Figures
- III. Looking Forward



I.

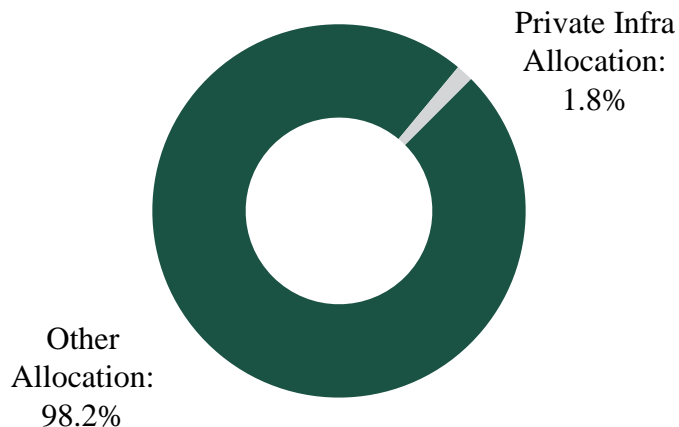
Infrastructure Program Update

Private Infrastructure Portfolio Snapshot

ERS remains in the early stages of building its Infrastructure Portfolio

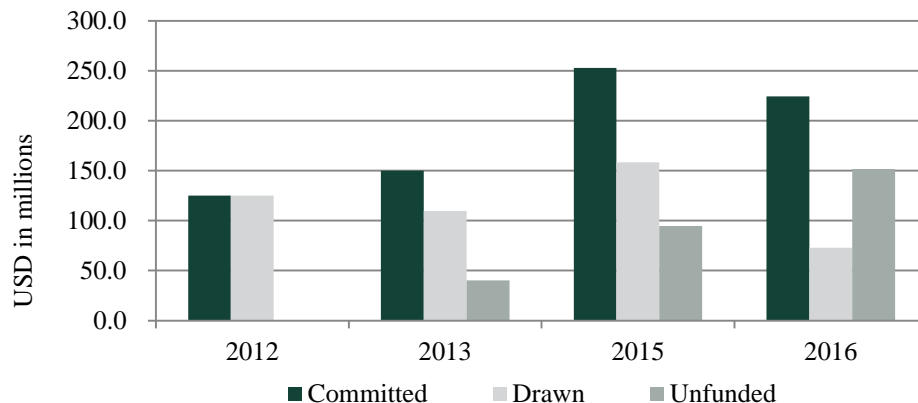
Private Infrastructure Allocation

- \$441 million Private Infrastructure NAV¹
- \$25.3 billion plan assets²



Portfolio Summary by Vintage

- \$752.5 million committed³
- 15 Investments



¹ As of December 31, 2016 (September 30, 2016 valuations adjusted for cash flows)

² As of November 30, 2016

³ As of December 31, 2016

Private Infrastructure Portfolio Snapshot

Investment	Vintage Year	Description
Co-Investment #1	2012	Construction project for 758 MW natural gas fired combined cycle power generation facility
Co-Investment #2	2012	Construction project for 758 MW natural gas fired combined cycle power generation facility
Co-Investment #3	2013	Construction project for 758 MW natural gas fired combined cycle power generation facility
Actis Energy 3	2013	Renewable energy and electricity transmission in emerging markets
Co-Investment #4	2013	Renewable energy and electricity transmission
ISQ Global Infrastructure Fund	2015	Value-add infrastructure fund targeting investments globally in energy, utilities, and transportation assets
Co-Investment #5	2015	Infrastructure development vehicle funding, owning, and operating three greenfield projects in the Americas

Private Infrastructure Portfolio Snapshot

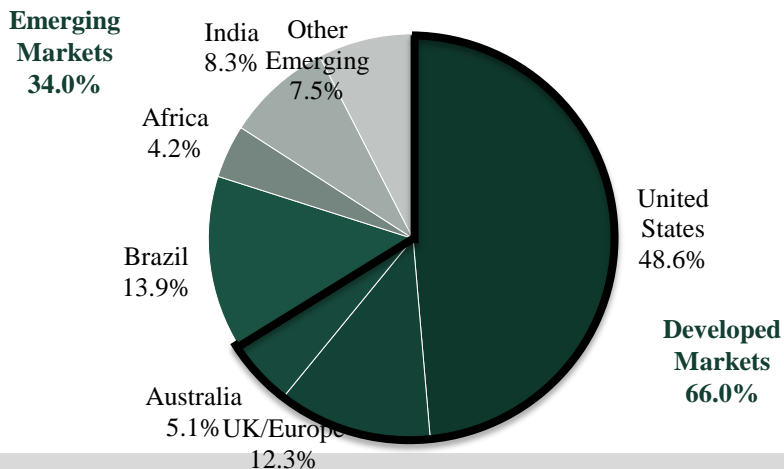
Investment	Vintage Year	Description
Co-Investment #6	2015	Hydropower development and operating platform in North America
Stonepeak Fund II	2015	Middle-market investments in power, water, midstream energy, renewables, transportation, and communications sectors
Co-Investment #7	2015	Owner and operator of Distributed Network Systems and other wireless communication infrastructure
QIC Fund I	2016	Global core transport, energy & utility, and PPP assets
Actis Energy 4	2016	Renewable energy and electricity transmission in emerging markets
Co-Investment #8	2016	Three-commodity gathering system
Co-Investment #9	2016	Utility company in thermal energy generation
Northern Shipping III	2016	Private credit investments in the maritime sector

Portfolio Snapshot - Geographic & Segment Exposure

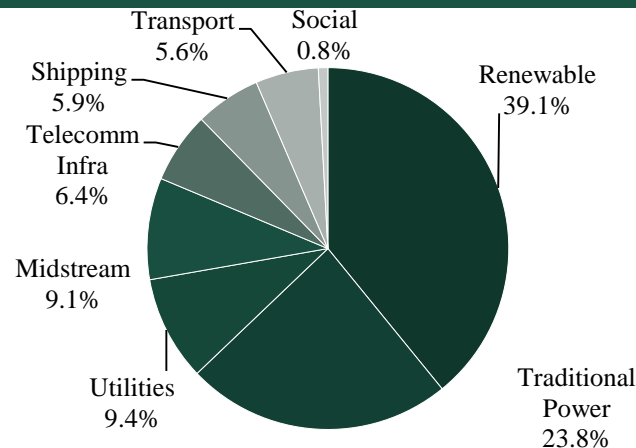
ERS' infrastructure portfolio remains in the early stages of diversification

- ERS' private infrastructure portfolio includes commitments to six fund partnerships and nine co-investments across seven manager relationships
- The program will eventually provide exposure to most major segments of the private infrastructure industry

Geographic Diversification



Segment Diversification

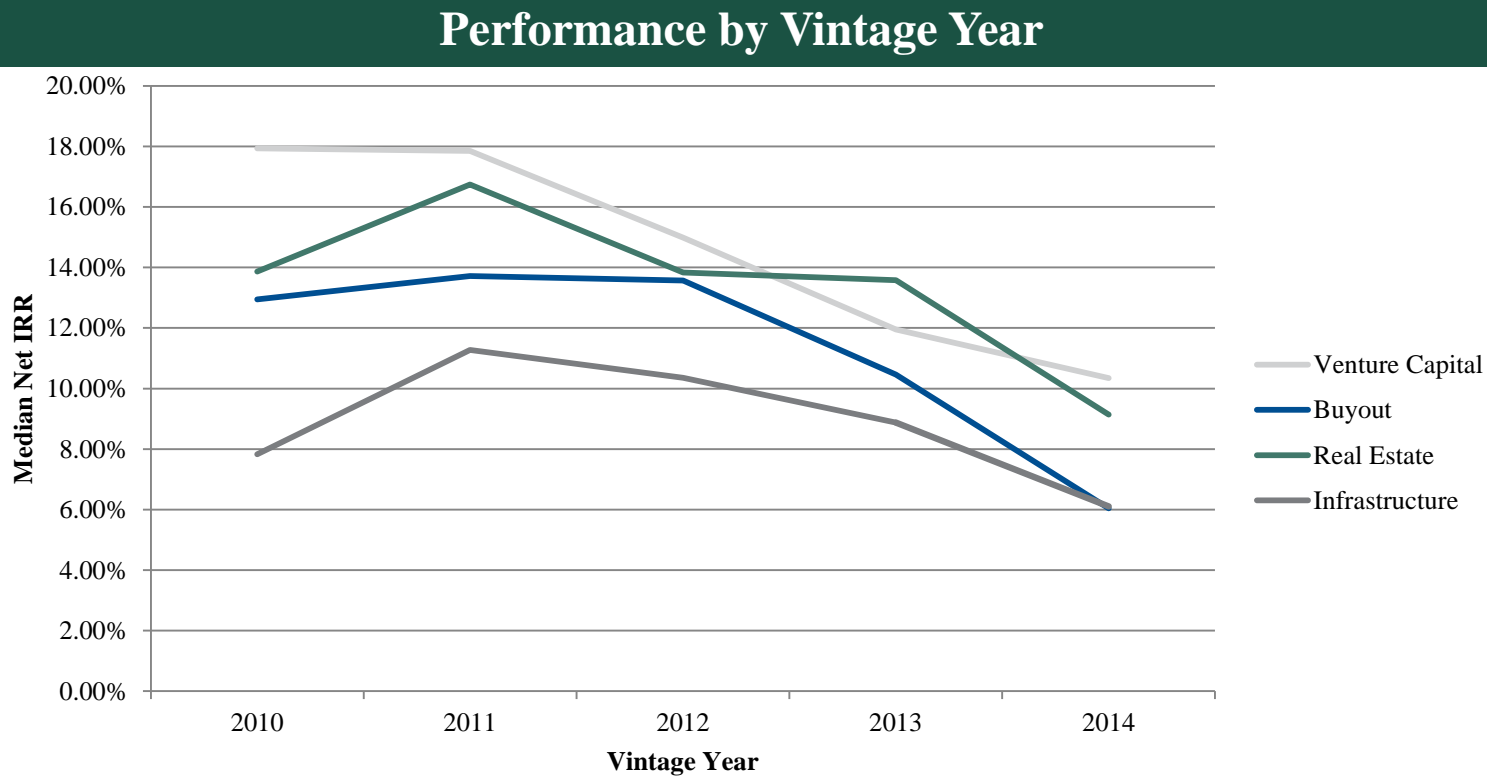




II.

Looking Back: Market Facts And Figures

Performance Comparison

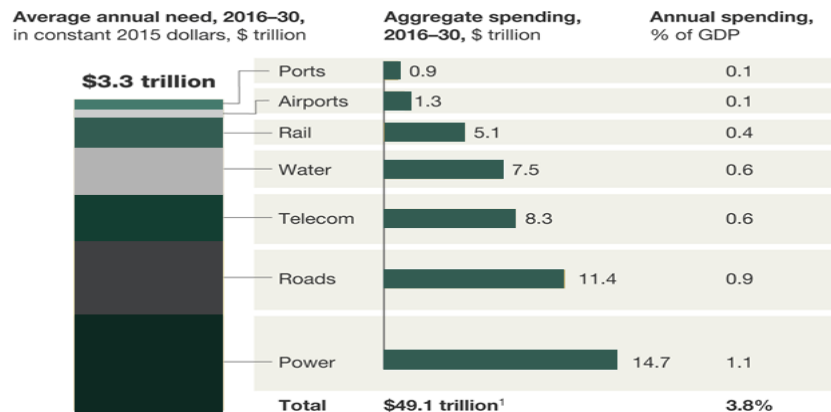


Need For Capital

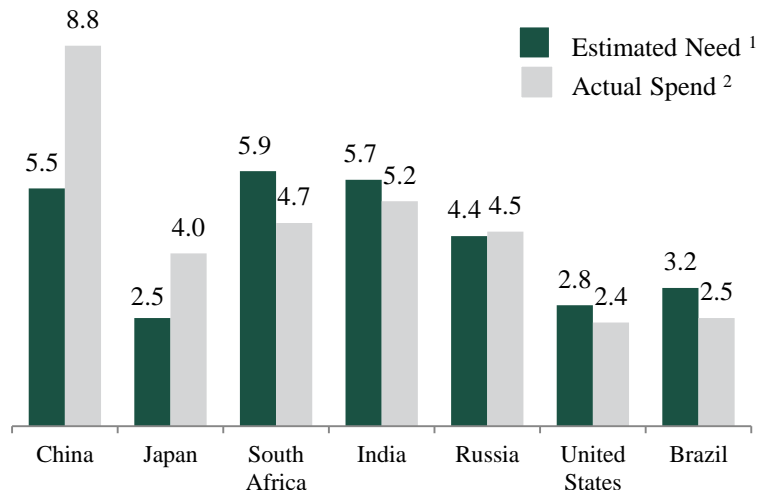
Infrastructure Needs

- According to McKinsey, the world needs to invest about 3.8 percent of GDP, or an average of \$3.3 trillion a year through 2030, in economic infrastructure just to support expected rates of growth

\$3.3 trillion Economic Infrastructure Investment Annually by Industry



Infrastructure Spending Percent of GDP



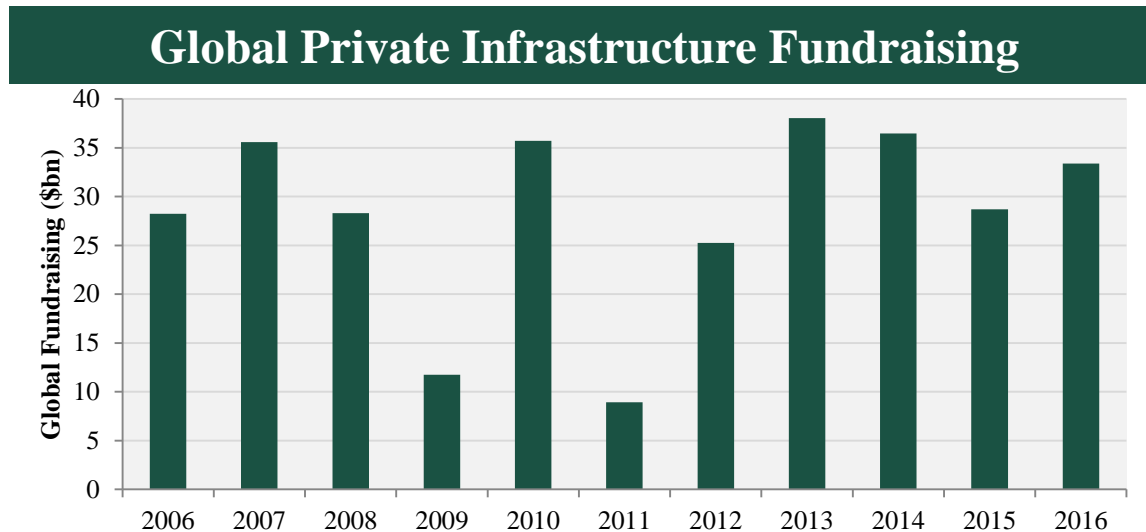
1) Estimated need based on projected growth, 2015–30

2) Weighted average annual expenditure over years of available data, 1992–2011

Source : ITF; GWI; IHS Global Insight; National Statistics; McKinsey Global Institute analysis

Infrastructure Fundraising

- Global infrastructure fundraising remains robust
 - The 2016 partial year is below the 2013 peak as of December 2016
 - Median fund size hit a record high \$742 million, showing the trend towards larger funds
 - Institutional investors continue to show strong interest in this asset class





III.

Looking Forward

Market Outlook for Infrastructure

- Investors will continue to expand their allocation to infrastructure
- Stress and distress in the midstream sector likely peaked in 2016, creating an attractive opportunity for contrarian investors
- Private infrastructure opportunities in the U.S. will continue to develop and grow, aided by the new administration's favorable stance towards PPPs
- Direct and co-investments will become increasingly important for larger investors
- Deal flow—and competition for deals—will likely remain strong



Challenges in Infrastructure Investing

- No shortage of capital chasing deals
- Premium valuations of, and lower expected returns from, most core infrastructure assets
- Geopolitical risk in emerging markets
- Regulatory risk everywhere
- Benchmarking performance
- Executing co-investments and direct deals with a small staff

Recommended Approach/Actions for FY 2018

- Invest with, or alongside, top managers possessing operational expertise and a local presence
- Move towards diversification targets by adding core and value-added exposure in developed markets (ex-U.S.)
- Focus on mid-market managers with strong competitive advantages
- Proceed with caution in emerging markets
- Maintain modest and realistic return objectives
 - Core Infrastructure: 7-8% net returns, the majority of which is current yield
 - Value-Add: 9-11% net returns with a smaller income component
 - Opportunistic: >11% targeted net returns, but with higher risk

Questions?

Public Agenda Item #11b

Review, Discussion and Consideration of the Private Infrastructure Program:

11b. Proposed Private Infrastructure Annual Tactical Plan for Fiscal Year 2017-2018

February 22, 2017

Pablo de la Sierra Perez, Assistant Director Real Assets

ERS Private Infrastructure Tactical Plan

FY2017-2018 IAC and Board Approval Request



- Review and consideration of FY2017-2018 ERS Private Infrastructure Annual Tactical Plan:
 - FY 2017: targeting \$250MM +/- 50% (\$125MM - \$375MM)
 - FY 2018: Propose to invest in 4-5 investments with commitments totaling \$250MM (including co-investments/direct investments)
 - Commitment target range +/- 50% (\$125MM - \$375MM)
 - Seek to diversify from a sector perspective
 - Seek capital aggregation platforms to gain scale and size
 - Continue to focus on co-investments / direct investments and establishing key relationships

Questions?

Public Agenda Item #12

Adjournment of the Joint Meeting of the Board of Trustees
and Investment Advisory Committee

February 22, 2017

Meeting of the ERS Board of Trustees

December 2, 2016



Public Agenda Item #13

*Review and Approval of the Minutes to the December 2, 2016
Meeting of the Board of Trustees*

February 22, 2017

Public Agenda Item #14a

*Presentation, Discussion and Consideration of the
Texas Employees Group Benefits Program:*

Health Insurance Financial Status Update for the First Quarter Fiscal Year 2017

February 22, 2017

Robert P. Kukla, Director of Benefit Contracts

Blaise Duran, ASA, MAAA and Manager of Underwriting, Data Analysis and Reporting

Fiscal Year 2017 Quarter 1

Outcomes



Overall Trend 7.1%

Prescription Trend 6.1%

Contingency Fund \$607.6 million
(End of FY2017 estimated)

Initiatives to Reduce Costs



Current FY 2017 initiatives in place
or being investigated to reduce plan costs are:



Patient-Centered Medical Homes

- HealthSelect's total savings for FY 2016 were \$11.9 million.
- Payments made to 4 of the 5 clinics totaling \$3.4 million.
- Expansion of program to Lubbock and Amarillo clinics.



Dependent Eligibility Audit

- Audit of all dependents enrolled in a health plan continues to be performed by Aon Hewitt.
- An estimated \$8 million was saved in FY 2016.
- This ongoing audit is projected to save an estimated \$8 million in FY 2017.

GBP Health Plan Financial Status

Actual versus Projected



All Health Plans Experience through November 2016 (\$Millions)	FY2015	FY2016	FY2017 <i>Projected</i>
Revenue			
State Contribution for State Agencies	\$1,653.1	\$1,801.5	\$1,954.5
State Contribution for Higher Education	706.9	773.7	839.4
State Contribution – Other	67.7	72.5	78.7
State Contribution - Total	2,427.7	2,647.7	2,872.6
Member Contributions	455.1	485.9	514.1
Other Revenue	219.9	280.9	368.9
Total Revenue	\$3,102.7	\$3,414.5	\$3,755.6
Health Care Expenditures	\$3,041.5	\$3,356.1	\$3,649.9
Net Gain (Loss)	\$61.2	\$58.4	\$108.7
Fund Balance	\$440.5	\$498.9	\$607.6
Other Expenses Incurred Outside of the GBP Fund			
Member Cost Sharing	\$480.4	\$487.8	\$493.8

Questions?

Public Agenda Item #14b

*Presentation, Discussion and Consideration of the
Texas Employees Group Benefits Program:*

HealthSelect Plans and Monitoring Strategy

February 22, 2017

Robert P. Kukla, Director of Benefit Contracts
Lauren Russell, Program Account Manager and CTCM

HealthSelect of TexasSM

Program Overview



- HealthSelect of TexasSM (“HealthSelect”) is a self-funded, managed care, point-of-service (“POS”) health plan.
- Available to active employees, retirees, and their eligible dependents
- Comprised of both a medical plan and prescription drug plan
 - United HealthCare Services, Inc. contracted through August 31, 2017
 - Caremark Rx, L.L.C. contracted through December 31, 2016

HealthSelectSM
of Texas

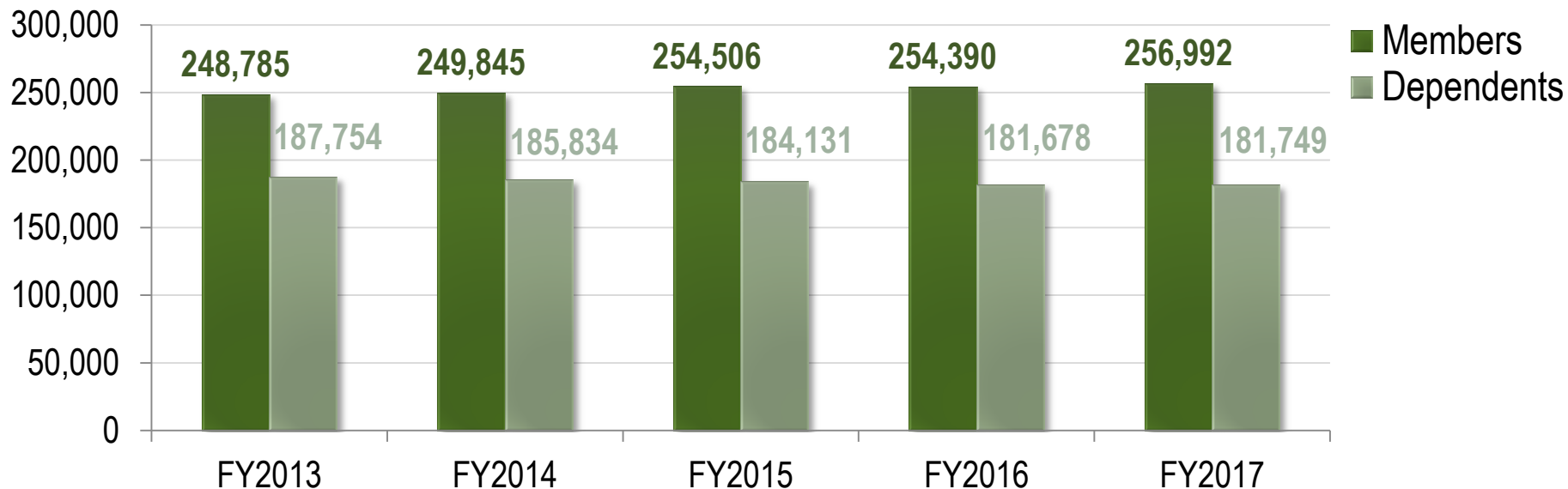


HealthSelect of TexasSM

Program Overview: Medical Plan



- Enrollment remains steady
- Approximately 82% of GBP participants enrolled



HealthSelect of TexasSM

Program Overview: Medical Plan



- HealthSelect expanded to include Consumer Directed HealthSelect effective September 1, 2016

High Deductible
Health Plan



Health Savings
Account



CONSUMER DIRECTED
HealthSelectSM

- Enrollment includes 343 members, 326 dependents

HealthSelect of TexasSM

Program Overview: Monitoring



- Dedicated CTCM-certified account manager monitors contractual compliance and program management
- Comprehensive compliance strategy includes:
 - ✓ Contract deliverable review schedule
 - ✓ Directives
 - ✓ Tracking of compliance and/or service issues
 - ✓ Compliance audit recommendations
 - ✓ Monthly Administrative Performance Report (MAPR)
 - ✓ Source document reporting
 - ✓ Quarterly & annual service reviews
 - ✓ Operational meetings
 - ✓ Ongoing Review of program activities

HealthSelect of TexasSM

Monitoring: Medical Plan



Monthly Administrative Performance Report (MAPR)

- 26 Criteria are monitored for contractual compliance
- Criteria are organized into 5 major categories:



Account Management



Customer Service



Systems and
Data Management



Operations



Legal Reporting/Disclosure



Monthly Administrative Performance Monitoring (MAPR) Heat Map Summary

HealthSelect of Texas
United HealthCare Services, Inc.

HEAT MAP COLOR LEGEND	
No applicable activity.	
Performance met standards.	
Performance did not meet standards; PG assessment waived.	
Performance did not meet standards; not a PG metric.	
Performance did not meet standards; PG assessment pending.	
Performance did not meet standards; PG assessed.	

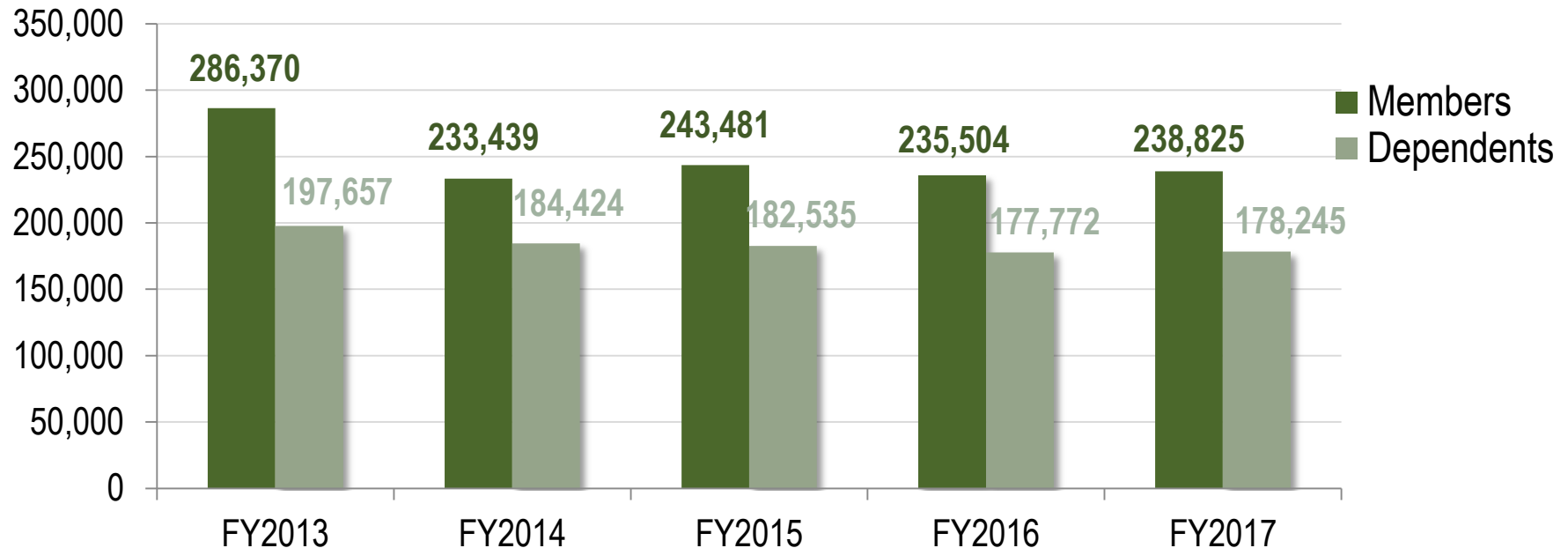
Description			Assessment Frequency	09-2015	10-2015	11-2015	12-2015	01-2016	02-2016	03-2016	04-2016	05-2016	06-2016	07-2016	08-2016
Account Management	Response to satisfaction survey (paper) at or above 15%	Non PG Item	12.30%												
	Participant satisfaction rate: paper claims survey	Non PG Item	83.70%												
	Participant satisfaction rate: call center, claims center	Non PG Item	96.30%												
	Overall participant satisfaction rate	Annually	85.90%												
	Written notice of changes	Any Incident	100%	100%	100%	100%	100%	100%	100%	100%	100%	<100%	100%	<100%	
	Communication materials: quality, timeliness	Any Incident	100%	100%	100%	100%	100%	100%	<100%	100%	100%	100%	100%	100%	
	Annual enrollment attendance	Any Incident												100%	100%
	Program reporting	Monthly	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	Grievance: timeliness for pre-service appeals	Monthly	100%	97.62%	98.11%	100%	100%	95.65%	92.86%	100%	98.48%	98.00%	100%	100%	
	Grievance: timeliness for post-service appeals	Monthly	99.20%	98.65%	99.65%	99.34%	98.51%	98.83%	98.41%	98.57%	98.87%	98.91%	99.66%	99.06%	
Grievance: support documentation provided	Any Incident	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		
Customer Service	Respond to written correspondence	Quarterly	100%			100%			100%			100%			
	Response to email correspondence	Quarterly	100%			100%			100%			100%			
	Manage ID card mail-outs	Monthly	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	Answer calls within 20 seconds	Quarterly	87.13%			88.11%			87.91%			87.97%			
	Customer service line availability at or above 99.5%	Quarterly	100%			100%			100%			99.80%			
Ops	Network provider turnover rate at or below 10%	Annually	≤ 10%												
	Claims processing: financial accuracy	Monthly	99.99%	99.80%	100%	100%	99.98%	99.30%	99.79%	99.20%	99.69%	99.81%	100%	99.87%	
	Claims processing: timeliness	Monthly	99.85%	99.82%	99.84%	99.77%	99.87%	99.82%	99.83%	99.83%	99.84%	99.86%	99.86%	99.65%	
System & Data Management	Process eligibility files accurately, timely	Any Incident	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	Ensure claims system(s) availability	Annually	99.88%												
	Ensure website availability	Annually	100%												
	Provide timely notification of file or transaction errors	Any Incident	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	Resolve file or transaction errors accurately, timely	Any Incident	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Legal Disc.	Reporting: administrative or regulatory issues	Any Incident	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
	Reporting: legal judgments assessed	Any Incident	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

HealthSelect of TexasSM

Program Overview: Prescription Drug



- Enrollment in the Prescription Drug Program remains stable



HealthSelect of TexasSM

Monitoring: Prescription Drug Plan



Monthly Administrative Performance Report (MAPR)

- 21 Criteria are monitored for contractual compliance
- Criteria are organized into 4 major categories:



Account Management



Customer Service

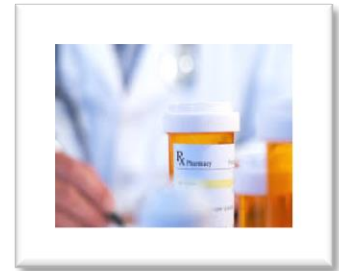


Operations



Systems and Data Management

HealthSelectSM
of Texas



Monthly Administrative Performance Monitoring (MAPR) Heat Map Summary

HealthSelect of Texas Prescription Drug Program

Caremark

HEAT MAP COLOR LEGEND	
No applicable activity.	
Performance met standards.	
Performance did not meet standards; PG assessment waived.	
Performance did not meet standards; not a PG metric.	
Performance did not meet standards; PG assessment pending.	
Performance did not meet standards; PG assessed.	

Description			Assessment Frequency	09-2015	10-2015	11-2015	12-2015	01-2016	02-2016	03-2016	04-2016	05-2016	06-2016	07-2016	08-2016
Account Management	Participant satisfaction rate	Annually	95%												
	Written notice of changes	Any Incident	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Communication materials: quality, timeliness	Any Incident	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Annual enrollment attendance	Any Incident												100%	100%
	Program reporting	Any Incident	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Customer Service	Respond to written correspondence	Quarterly	100%			100%			100%			100%			
	Manage ID card mail-outs	Monthly	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Answer calls within 30 seconds	Quarterly	81.33%			88.67%			89.67%			96.00%			
Operations	Paper claims processing: financial accuracy, timeliness	Annually	100%												
	Claims adjudication: financial accuracy, timeliness	Monthly	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Claims financial accuracy rate (based on audit)	Annually	Pending finalization of external audit results												
	Claims payment accuracy rate (based on audit)	Annually	Pending finalization of external audit results												
	Dispensing accuracy rate	Annually	99.99%												
	Dispensing rate: protocol prescriptions	Monthly	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Dispensing rate: non-protocol prescriptions	Monthly	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	System and code changes	Any Incident	<100%	100%	<100%	<100%	100%	100%	100%	100%	100%	<100%	100%	<100%	
System & Data Management	Process eligibility files accurately, timely	Any Incident	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	<100%
	Ensure claims system(s) availability	Annually	99.92%												
	Ensure website availability	Annually	99.75%												
	Provide timely notification of file or transaction errors	Any Incident	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
	Resolve file or transaction errors accurately, timely	Any Incident	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Agenda item 14b, Meeting book February 22, 2017

Questions?

Public Agenda Item #15

Executive Director Agency Update

February 22, 2017

Porter Wilson, Executive Director

Executive Director Agency Update

Legislative Update



- Legislative Analysis Group (LAG)
- Filed Bills Update
- Budget Update
- Hearings
 - Senate Finance
 - Senate Workgroup on Health Care Costs
 - House Appropriations
 - House Pensions

Executive Director Agency Update

Sunset Update



Sunset Recommendation 2.2:

ERS should establish an advisory committee to obtain regular stakeholder and expert input on benefits (GBP specific).

- Existing Statutory Authority: Texas Government Code §815.509
- Proposals for committee composition and operation will be presented for board consideration during the May and August meetings
- Committee meetings anticipated to begin during fiscal year 2018

Executive Director Agency Update

2017 Board of Trustees Election



Four state employees were certified as candidates on February 15

- ❑ Catherine A. Melvin – Texas Department of Public Safety
- ❑ Morgen Ashley Cuming – Texas Board of Professional Engineers
- ❑ Benito Ybarra – Texas Department of Transportation
- ❑ Jacqueline “Jackie” A. Dickerson – Texas Department of Criminal Justice



Candidate forum will be held March 9



Voting period runs March 10 through April 14



Election results will be certified May 10

Executive Director Agency Update

Board Web Portal Service



- ERS will use a new web service beginning with the May meeting to share and manage Board meeting agenda items, exhibits, and minutes



Provides users with paperless option



Efficient, secure means to share information



Allows users to save notes electronically

Executive Director Agency Update

Changes to ERS' Online Presence



1. Website redesign

- Goal: easier for users to find and understand information
 - Including responsive design
- Conducted every 3-4 years
- External experts reviewed site and suggested changes

2016 Website Usage

1 million+ users

Almost 8.8 million page views

551 pages, 447 PDFs

Executive Director Agency Update

Changes to ERS' Online Presence



2. New content management system (CMS)

- Cost savings
- Easier management

3. New domain name: **ers.texas.gov**

- Department of Information Resources request to all state agencies
- Affecting entire website (including subsites) and email addresses
- Redirection for at least one year

Executive Director Agency Update

Changes to ERS' Online Presence



All three changes will be implemented at the same time to simplify communications and adjustments for users: late April or August

Benefits Communications is planning extensive communications to inform and educate users about the changes.

Executive Director Agency Update

2017 Everything's Fitter in Texas Challenge



Formerly known as Get Fit, the annual statewide challenge has a new name, a new logo and new, user friendly website for 2017.

The Challenge launched on Feb. 6 and concludes on April 16. 18,000 state employees registered for the Challenge – more than any other year since Get Fit started in 2013.

Closer to home, at ERS 313 employees – or 90% of ERS FTEs -- are participating.

Executive Director Agency Update

ERS Director Retirement



ERS Says Farewell and Congratulations!

Benefits Contract Director, Rob Kukla is Retiring on March 31, 2017 with 10 years, 9 months of state service.



Questions?

Public Agenda Item #16

Set Date for next Joint Meeting of the ERS Board of Trustees and Investment Advisory Committee, the Next Meeting of the Board of Trustees and the Meeting of the Audit Committee

February 22, 2017

Next Meeting Dates



2017 Meeting Dates:

Wednesday, February 22, 2017

Wednesday, May 17, 2017

Wednesday, August 23, 2017

2 Day Workshop:

Tuesday - Wednesday, December 12 & 13, 2017

Public Agenda Item #17

Adjournment of the Board of Trustees

February 22, 2017